

Commercial Fisheries Abstracts

a monthly summary of important developments
for the fishery industries

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Commercial Fisheries Abstracts



Prepared in the Branch of Commercial Fisheries

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The abstracts in this leaflet may be left in their present form; but it is suggested that to make the most efficient use of them, they be cut out on the lines designated and filed by the number in the upper left-hand corner of each. For a full description of this filing system see "Fishery Technological Abstract Card System" by Maurice E. Stansby and K. L. Osterhaug, Fishery Leaflet No. 232, obtainable free by request from Fish and Wildlife Service, Washington 25, D. C.

In addition to the regular abstracts, there is included a bibliography of references of secondary importance (without abstracts). These may be cut off on the lines designated and pasted on standard 3 x 5-inch cards for filing.

Following is a brief outline of this filing system. The numbers apply to the first digit appearing on each card. For the meaning of subsequent digits, please see the above described leaflet.

- | | |
|---------------------------|----------------------|
| 0 General and theoretical | 5 Vitamins |
| 1 Fish by species | 6 Fishery byproducts |
| 2 Fresh fish | 7 Analytical Methods |
| 3 Preserved fish | 8 Composition |
| 4 Oils | 9 Miscellaneous |

2.00 THE INFLUENCE OF THE QUALITY OF THE FISH IN THE FISH PLANT ON THE SUBSEQUENT KEEPING TIME IN RETAIL STORES IN ONTARIO Castell, C. H.; MacCallum, W. A.; and Power, H. E. (Atlantic Fisheries Experimental Station, Halifax, N. S.) Fisheries Research Board of Canada, Progress Reports of the Atlantic Coast Stations, No. 60, 9-13 (December 1954) A number of surveys made between 1937 and 1952 in the retail stores in Toronto, Montreal, and Ottawa by members of the Atlantic Fisheries Experimental Station showed that about 40 percent of the fish reaching the consumer had already developed spoilage odors. In the journey from the sea to the consumer, fish encounter one set of conditions in the hold of the vessel at sea, another set in the processing plant, a third set aboard the transportation vehicle, and a fourth set in the wholesale and retail stores. A certain amount of deterioration occurs under each of these conditions so that the quality of the fish when it reaches the consumer consists of the sum of all the changes that took place since the fish left the sea. The survey team wanted to know what quality fish could be expected in the retail stores of Ontario and eastern Quebec if fresh fish were always delivered to the railways. To answer this question, they decided to ship fresh-cut haddock filets that were free from all perceptible spoilage odors and that had less than 1 mg. trimethylamine nitrogen per 100 g. of fish. Two hundred 20-pound boxes of fresh filets were shipped during July and August to an Ontario town. Some of these filets were packed in metal boxes, some were prechilled immediately before shipment, but most were packed and shipped in plain boxes. All of the filets were transported by railway express in the same manner as are commercial fish shipments. When each shipment of the (over) COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 4, PAGE 1 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Martin Heerdt	2.114 RECENT DEVELOPMENTS IN FISHING-VESSEL DECK GEAR Carlson, C. B. Commercial Fisheries Review 16, No. 11, 10-16 (November 1954) Pumps developed on the Atlantic, Gulf, and Maine coasts for use in the unloading of menhaden and sardines have replaced an unpopular hand-labor method, sped-up unloading of vessels, and made the whole unloading and cleaning-up operation less messy. Centrifugal or reciprocating pumps are used. They remove fish from a hold by pumping them, with large quantities of sluicing water, to the unloading dock. The centrifugal pump, preferred in some areas because of its compactness, is used for brailing menhaden. The "hardening" of menhaden makes pump brailing desirable, as it saves time and gear by making it unnecessary to "dry" the fish to the same degree as is required for menhaden unloaded by conventional brailing. A vessel unit usually is comprised of a main pump and a priming pump driven by a gasoline or diesel engine. On some vessels, a sluicing pump is included in the unit. Both the intake and discharge end of the pumping hoses are grilled to prevent the net from being drawn into the pump and to separate the fish from the water at the discharge end. Powered seine reels have increased the efficiency of a purse seiner and crew from 6 or 7 sets per day with an 8- or 9-man crew to as much as 20 sets per day with a 5-man crew. The reel is mounted in a well near the stern. A level-wind system aids rolling the net on the reel evenly. The reels are powered by mechanical or hydraulic means and have variable speeds as well as forward and reverse running. Power is the feature of the mechanical drive, whereas control is the feature of the hydraulic drive. The seine has to be hung on a 3-percent or 5-percent basis for deep nets, whereas conventional seines are hung on a 10-percent basis. (over) COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 4, PAGE 1 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: M. R. Greenwood
2.00 PROBLEMS IN SPOILAGE OF CANNED FISH. 1. THE GAS-FORMING DECOMPOSITION PRODUCTS Meyer, Victor Veroffentl. Insts. Meeresforsch. Bremerhaven 1, 204-24 (1952) Chemical Abstracts 48, No. 21, 13121 (1954) A method is described for the detn. of gas mixts. from expanded cans, which simultaneously permits a satisfactory bacteriol. examn. The gas analyses were carried out by a modified Union-Orsat app. The following were detd.: CO₂, N₂, H₂, methane, and O₂. The gas mixts. from material free of carbohydrates, especially in acid medium, contained mostly CO₂ or CO₂ + H₂S. In weakly acid medium there appeared occasionally greater quantities of H₂, where the relationship CO₂: H = 2:3 was found as an extreme case. A citric acid cycle is suspected. During longer incubation the H content decreased and the H₂S formation increased. In cans where carbohydrates were added, besides CO₂ greater quantities of H₂ were also detd. Under similar conditions the H formation was dependent on pH and reversed after prolonged storage, while the quantities of H₂S rose. With a fermentation diagram on hand it is shown that in carbohydrate fermentation a relationship CO₂: H = 1:2 is still possible. Higher quantities of H were traced back to metallic corrosion. Methane was seldom found and then only in small amts. Conclusions: For cans with acid infusions, especially marinated ones, the H formation can be traced to chem. curvatures and the CO₂ formation to biol. ones. In cans with higher pH values, especially with adms. of carbohydrate, the H can also be of biol. origin and on occasion constitute double the amt. of the CO₂ formed. For further diagnosis bacteriol. conditions and metallic corrosion should be investigated as well as end products other than gaseous. (over) COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 4, PAGE 1 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Martin Heerdt	2.00 POST-MORTEM CHANGES IN THE LENSES OF FISH EYES: ASSESSMENT OF STORAGE TIME AND FISH QUALITY Love, R. M. (Torrey Research Station, Aberdeen, Scotland) Journal of the Science of Food and Agriculture 5, No. 12, 568-572 (December 1954) Freshly caught fish normally have clear black pupils, whereas fish that have been kept for a few days in ice show pupils with varying degrees of milkiness. The present study was made to examine the changes in appearance of the eyes of cod and haddock and to investigate the possibility of using the eye examinations as a rapid objective method for assessing storage time and fish quality. The turbidity seen in the pupils of cod and haddock eyes actually occurs in the crystalline lenses. A study of the lenses taken from cod and haddock that had been kept for varying lengths of time in ice yielded the following information. (1) Turbidity was essentially a surface effect in that the lenses appeared to be wider around the edge than around the center. (2) Differences in turbidity were more easily detected if the lenses were seen against a dark background after immersion in physiological saline than if they were examined dry. (3) A dense patch of whiteness usually formed on the lens and covered as much as 50 percent of the surface area. This patch was more opaque than the rest of the lens, was always nearest to the cornea, and was of a lower specific gravity than the rest of the lens, so it always became oriented with the patch uppermost if placed in saline. (4) The size and fragility of the lens increased with an increase in the time that the fish were held in ice. If fish were held more than 12 days, care was needed to remove the lens without causing it to burst. (over) COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 4, PAGE 1 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Martin Heerdt
FACTORS INFLUENCING FISH QUALITY SPOILAGE OF CANNED FISH	DEVELOPMENTS IN DECK GEAR EYE-LENS OPACITY VS. FISH QUALITY

2.00

The authors concluded that the method likely to give the best criteria of quality would be a visual comparison of the lens with a set of artificial standards of graded cloudiness. Hence, a number of glass bulbs about the size of fresh cod lenses were made and filled with 'light' magnesium carbonate suspended in 0.3 percent agar dissolved in a 50-50 glycerol-water solution. A total of 22 standards were made up. They were placed in a row in a wide Petri dish on a dark background and covered with physiological saline. To obtain the fish lenses for comparison, the fish eyelids were cut away with the aid of a pair of fine-pointed scissors and a forceps. A semi-circular cut was then made in the side of the eyeball without puncturing the lens, and the lens was pushed out through this incision. The ring of vitreous humour adhering to the lens was cut away, and the free lens was compared in the dish of saline with the standards.

The results showed a linear relationship between the development of lens opacity measured on the arbitrarily numbered scale of turbidities and the time of storage. From the estimates, it appears practical, by using samples of 20 to 30 lenses, to estimate in about 20 minutes the time that haddock or cod have been stored in ice under given standard conditions, with an error of not more than 1 day over the range 0 to 17 days.

If the standard conditions that are chosen are as nearly as possible representative of average commercial conditions, the method of estimating the duration of the storage of fish in ice by measuring lens opacity may prove to have value both in research and in practical inspection of market fish. It has not been shown whether this method provides a consistently good index of freshness from an organoleptic standpoint. To eliminate the rather tedious routine work involved in matching at least 20 lenses for each estimation, a photoelectric device designed to measure the light-scattering of 20-25 lenses in a flat glass cell is being designed.

2.00 (Cross References: 2.19, 2.6)

fresh fish reached the Ontario retail store, 12 fillets were removed, wrapped in paper, and stored in aluminum containers which were buried in ice. These fillets were examined carefully each day beginning with the time of their arrival to determine how long they could be stored.

Table 2, omitted, shows that every shipment could be sold at retail before spoilage odors developed. These results indicate that if the merchant will keep his fish at close to 32°F., it is commercially possible to furnish the consumer with good quality fish by using the present processing-plant and railway facilities. This study also shows that the most critical stage in the history of the fish is its period of storage in ice at sea.

By taking enough representative samples when the fish are unloaded it is relatively easy to determine the amount of spoilage that has occurred on the vessel at sea. The time that the fish will stay fresh depends upon their quality when landed. Table 1 shows the quality of 850 fillets from haddock immediately after the fish were unloaded from the vessel.

Table 1. -- Percentage of haddock fillets judged "fresh," using trimethylamine value (under 1.0 mg. per 100 g. of fish) and odors as standards of freshness

Days in trawler	PERCENTAGE JUDGED "FRESH" BY MEANS OF		
	Odor alone	Trimethylamine alone	Odor and trimethylamine
1	100	100	100
2	100	100	100
3	100	100	100
4	89	82	82
5	66	46	42
6	71	39	39
7	54	17	16
8	34	20	16
9	0	2	0

2.114 (Cross Reference: 2.112)

Chill tanks in the shrimp industry have been found valuable in retarding "black spot," a discoloration frequently encountered in the holding of uncooked shrimp. Sea water chilled to 30°F. or lower keeps shrimp palatable up to 24 days. Shrimp held 18 days in ice are unmarketable. An offensive odor develops in shrimp held in chilled sea water more than 14 days, however, and measures are being taken to combat the spoilage bacteria. Chilling can be done more rapidly with sea water than with ice, and the tanks provide a convenient place to hold shrimp until they can be processed. Although some loss of flavor occurs, shrimp can be kept in excellent condition for 5 days by this method.

Air-pressure controls for winches make it possible for only one man to operate 2 drums if he uses two hands; whereas mechanical controls require two men each using both hands or each using a hand and a foot, or one man using both hands and both feet. Rapid response of the air controls provide safety for both crew and gear. Drive mechanisms are safeguarded in that full friction and full brake cannot be applied against each other. The only disadvantage of the air control is its higher cost.

3. 12 AUREOMYCIN IN EXPERIMENTAL FISH PRESERVATION. II. Gillespie, D. C.; Boyd, J. W.; Bissett, H. M.; and Tarr, H. L. A. (Pacific Fisheries Experimental Station, Vancouver, B. C.) Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 100, 12-15 (October 1954) Further trials were carried out with aureomycin as a fish preservative for use in chilled sea water and in ice. In part 1 of this study, aureomycin flake ice and ordinary crushed ice were compared as a packing medium for dressed troll-caught coho salmon. These iced fish, on arrival at the shore plant, were weighed and reiced with their respective ice in boxes for shipment. On arrival at Vancouver, the salmon were examined and a number of them were selected at random from each iced treatment for bacterial plate counts. These counts were determined on 1-inch-thick center steaks that had been cut individually from each fish, then wrapped in cellophane, and stored separately for varying lengths of time at 32°, 38°, or 50° F. The remaining salmon were reiced in their respective ice and stored in insulated boxes for further sampling. The results of the various tests are shown in table 1 (this card, over). Ice containing 1.25 parts per million aureomycin had a favorable effect on keeping quality. In part 2 of this study, coho salmon from various fishing camps were stored, in part, in hold A of a packer boat, in ice containing 1 part per million aureomycin, and, in part, in hold B, in ordinary ice. These fish were dressed fish that had not been iced prior to arrival aboard the boat. It is believed that this delay permitted considerable penetration of bacteria into the exposed flesh and that these bacteria might not come in contact with the aureomycin solution from the melting ice. The average bacterial count of 7 salmon that had been stored in ordinary ice was 300,000,000 per gram. (over) COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 4 PAGE 3 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Martin Heerd	3. 234 SOME FACTORS AFFECTING THE SODIUM CHLORIDE CONTENT OF HADDOCK DURING BRINE-FREEZING AND WATER-THAWING Holston, J. and Pottinger, S. R. (Fishery Technological Laboratory, East Boston, Massachusetts) Food Technology 8, No. 9, 409-414 (September 1954) The authors studied the effects of brine temperature, brine concentration, brine composition, and immersion time in the brine on the penetration of salt into brine-frozen fish. Salt penetration during immersion freezing was found to vary directly with the temperature of the brine. Penetration became excessive from the standpoint of palatability if the brine temperature rose above 15° F. The authors recommended, therefore, that the temperature of the sodium chloride brine (23 percent) be maintained at or below 10° F. when fish are being frozen. Immersion in the brine for longer than is necessary for freezing causes an excessive penetration of salt. When fish are brine frozen, salt penetrates at a rapid rate until the outer layers of flesh become frozen. The rate of penetration then decreases, but the penetration of the salt never stops entirely. Prolonged immersion of haddock in brine causes it to thaw as a result of excessive salt penetration. This secondary penetration can be reduced by maintaining the brine at the lowest practicable temperature. Thus, the factors of brine temperature and immersion time are closely interrelated with penetration of salt into the flesh of the fish. It was recommended that brine immersion be limited to 4 hours or less. If the brine concentration is increased, the rate of salt penetration into the fish during freezing also increases. The Boston Laboratory uses a eutectic (23 percent) sodium chloride brine for its semicommercial operations. This strength of brine gives the minimum freezing temperature and most (over) COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 4 PAGE 3 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Martin Heerd
3. 5 THE CONTROL OF DUN IN SALT FISH PLANTS Vaisey, E. B. (Atlantic Fisheries Experimental Station, Halifax, N. S.) Fisheries Research Board of Canada, Progress Reports of the Atlantic Coast Stations, No. 60, 4-6 (December 1954) It is usually easier to prevent infection by dun (Sporendonema epizoom) than to attempt to clean up the plant afterwards. Since the initial dun infection of salt fish occurs in the buildings where they are processed, 'dun-free' buildings should be used to process only 'dun-free' fish. The author performed the following experiments to find means of killing dun under the circumstances that exist in salt-fish plants: Pieces of rough wood 2 by 2 by 1/4 inches were soaked in a suitable nutrient broth, allowed to dry, and dipped in a suspension of dun spores in nutrient broth. These pieces of wood were incubated for 7 days, dipped for 10 seconds in various disinfectant solutions, and allowed to drain on edge. The pieces of wood, when thoroughly dry, were firmly pressed momentarily against the surface of nutrient agar in petri dishes. The percentage area of the agar that developed dun growth was used to estimate the amount of dun that survived disinfection. The results in table 1 (this card, over) show that dun can be killed easily and cheaply by the use of common disinfectants. Similar results can be obtained by spraying or painting the disinfectant on the walls, floors, ceiling, and rafters of a salt-fish plant. Surfaces to be sprayed must be free from dirt, dust, salt, and other residue before the disinfectant is applied. If the building or room can be made airtight after having received a preliminary cleaning, it can be disinfected with sulfur dioxide gas or formaldehyde vapors in as little as 2 hours, according to Hess (Atlantic Progress Reports, No. 27, 1940). (over) COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 4 PAGE 3 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Martin Heerd	3. 9 A HISTOLOGICAL AND HISTOCHEMICAL STUDY OF BEEF DEHYDRATION. IV. CHARACTERISTICS OF MUSCLE TISSUES DEHYDRATED BY FREEZE-DRYING TECHNIQUES Wang, H.; Auerbach, E.; Bates, Virginia; Doty, D. M.; and Kraybill, H. R. (American Meat Institute and Department of Biochemistry, University of Chicago) Food Research 19, No. 5, 543-556 (September-October 1954) Slices of Biceps femoris and Semimembranosus muscles were pre-frozen at -150° C., -80° C., or -17° C. and lyophilized under pressures of 0.001 to 0.3 mm. mercury. Samples so dried by sublimation revealed a rate of moisture removal that was uniform and significantly faster than in similar samples dehydrated by warm-air methods. Partially lyophilized samples contained a central core of raw muscle tissue. Freeze-drying proceeded from the surface. The morphological pattern of frozen-dried muscle tissue depended upon pre-freezing rate which was determined by pre-freezing temperature. Despite differences in structural organization of lyophilized tissues, pre-frozen at three different temperatures, all had these common characteristics: (a) no change in total volume of tissue; (b) no sign of denaturation of muscle fiber protein; and (c) presence of a space system which thoroughly interpolated dried muscle fibers. All frozen-dried samples, regardless of pre-freezing temperature, rehydrated to 85-90% of original moisture content, and their muscle fibers returned to 89-98% of their original diameter. (over) COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 4 PAGE 3 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: summary
PRESERVATION OF FISH WITH AUREOMYCIN CONTROL OF DUN IN SALT-FISH PLANTS	BRINE FREEZING OF HADDOCK EFFECT OF FREEZE-DRYING ON TISSUES

3. 5

A paint known as "Dairy White" was also tested for toxicity to dun. To accomplish this, the authors covered pieces of clean glass or freshly painted wood with thin layers of sterile soil, salt, nutrient agar, or filter paper. They then sprinkled the samples with a standard amount of dun-spore suspension and incubated them for 5 days. It was possible to rehydrate the dun from the glass but not from the freshly painted wood. After the paint had aged on the wood for 6 months, it still killed dun on contaminated filter paper, but it did not kill dun in soil, salt, or agar. Therefore, 6-month-old paint would not be effective unless fairly clean. Other paints, particularly those that contain added germicidal ingredients would also prove useful in the long-time control of dun.

Thermal-death-point studies showed that all the dun spores out of a group of 100,000 can be killed by immersion in a 10-percent salt solution for 7 minutes at 55°C. (131°F.). The killing time may be shortened to 5 minutes if tap water is used in place of salt solution. Therefore, salt-fish producers may use hot water to kill dun on table tops and other places where it is advisable to use disinfectants.

They may also increase the efficiency of a disinfectant solution by applying it when hot.

(These studies show incidentally that the bacteriologist should not use the conventional method of mixing a dun inoculum with hot melted agar when a plate count is desired.)

Table 1. The percentage of dun on rough wood surfaces surviving disinfectant dips

Disinfectant	Concentration used	Survival		Cost per gallon (approx.)
		Replicates		
	%	1	2	cents
Water (control)	...	60	80	...
Formalin	1.0	0	0	3.2
	2.5	0	0	...
R2L	0.3	0	0	2.3
	1.0	0	0	...
Hyamine 1622	0.1	0	5	...
	0.3	0	0	0.5
Wescodyne	0.3	0	0	2.0
	1.0	0	0	...

3. 12 (Cross Reference: 3.17)

whereas the count for salmon that had been stored in aureomycin ice was 170,000,000. This study showed that bacterial growth was not inhibited by the aureomycin ice.

In part 3 of this study, round sockeye salmon that had been held for 1 to 3 days in ordinary ice were dressed and washed. Five of these fish were packed in ordinary ice in insulated boxes, and 5 were packed in aureomycin ice. After 9 days, the fish in ordinary ice showed 19 million bacteria per gram, whereas those in aureomycin ice showed 0.26 million bacteria per gram. After 14 days, these counts were, respectively, 242 and 2.1 million bacteria per gram.

In part 4 of this study, dressed coho salmon were stored aboard a trawler in ordinary ice, in 1-part-per million-aureomycin ice, in circulating sea water at 28°F. without aureomycin, or in circulating sea water at 28°F. with 2 parts per million aureomycin. With fish being used that were landed 8 days after catching, accelerated spoilage tests were carried out by incubating streaks for 1 day at 50°F. Plate counts showed a marked retardation of bacterial spoilage with ice or refrigerated sea water.

TABLE 1—Effect of failed ice containing 1 p.p.m. of Aureomycin, and of ordinary ice, on the keeping quality of coho salmon.

Date of sampling and method of holding samples before making examination	Post-mortem age of fish at sampling (days)	Bacterial count* (millions per gram)	(Continued, same headings as at left)			
			Ordin-ary	Ordin-ary	Ordin-ary	Ordin-ary
August 3; 24 hours at 50°F.	3 } 5 } 8 }	20 38 37	9 } 12 } 12 }	56 } 110 } 0 }	Ordin-ary	56 } 110 } 0 }
September 1; 24 hours at 50°F.	3.5 } 3.5 } 7 }	11 33 130	9 } 12 } 12 }	7 } 7 } 7 }	Aureo-mycin	0 } 0 } 0 }
September 8; 20 hours at 32°F.	3.5 } 3.5 } 7 }	0 0 0	7 } 7 } 7 }	20 } 35 } 35 }	Ordin-ary	20 } 35 } 35 }
September 8; 20 hours at 32°F.	3.5 } 3.5 } 7 }	0 0 0	7 } 7 } 7 }	93 } 0.42 } 394 }	Aureo-mycin	93 } 0.42 } 394 }
September 8; 20 hours at 32°F.	3.5 } 3.5 } 7 }	50 50 0	7 } 7 } 7 }	7 } 7 } 7 }	Ordin-ary	7 } 7 } 7 }

* A count of "0" indicates less than 0.26 million bacteria per gram.

3. 9

Potassium distribution of frozen-dried muscle tissue was essentially that of fresh raw muscle. A limited degree of potassium displacement was found on rehydration.

Partially lyophilized core-containing samples were subsequently dried in a vacuum oven at 23°, 45°, or 70° C. until complete or nearly complete tissue dehydration was obtained. Oven-drying did not change the peripheral sublimated tissue; sample volume was also unchanged; and the original boundary between periphery and core remained intact. Water loss from the core brought simultaneous muscle fiber shrinkage and emergence of an enormous space system. These changes were not accompanied by muscle fiber merging or cross-striation loss.

Oven-dried partially lyophilized samples rehydrated to a significantly higher level than was achieved by dehydration at 65° or 70° C. without freeze-drying. The tissue achieved a fair degree of reconstitution.

3. 234 (Cross References: 3.239, 1.5)

rapid freezing rate attainable with sodium chloride brine. Under these conditions, salt penetration is not a problem.

The penetration of salt into fish frozen in sodium chloride brine can be retarded by the addition of small amounts of the salts of calcium (1 percent) and potassium (0.6 percent). Fish frozen in this type of modified brine pick up from 25 to 33 percent less salt in the first one-quarter inch of the flesh than do fish frozen in brine containing sodium chloride only.

Commercial fillets cut from fish that were eviscerated prior to being frozen in 23-percent sodium chloride brine were below the optimum range of palatability for salt (0.9 to 1.2 percent). That is, thawing of these fish prior to filleting reduced the salt content to 0.5 to 0.6 percent. Salt penetration was excessive only in the nape of the eviscerated fish, and this portion is not normally used in preparing commercial fillets.

Analyses of random samples of fish drawn from lots frozen from different voyages of the Delaware showed that, under normal operating conditions, there was very little difference in the amount of salt penetration.

After water thawing, the salt content of the brine-frozen fish was reduced to a level that is below the desired taste threshold. These analyses also showed that excessive salt penetration does not occur during routine freezing operations. Scrod haddock and large haddock frozen semicommercially in brine showed a salt penetration that was restricted almost entirely to the first one-quarter inch of flesh. This salt could be leached out during the water thawing of the frozen fish so that the final product was almost bland or flat in taste.

3. 9 A HISTOLOGICAL AND HISTOCHEMICAL STUDY OF BEEF DEHYDRATION. V. SOME FACTORS INFLUENCING THE REHYDRATION LEVEL OF FROZEN-DRIED MUSCLE TISSUE Auerbach, Earl; Wang, H.; Maynard, Nehema; Doty, D. M.; and Kraybill, H. R. (American Meat Institute Foundation and Department of Biochemistry, University of Chicago) Food Research 19, No. 5, 557-563 (September-October 1954) Six factors believed to influence rehydration of frozen-dried muscle tissue have been investigated: (a) orientation of muscle fibers with reference to main absorptive surfaces of the sample; (b) thickness of the sample; (c) temperature of rehydrating solution; (d) osmotic pressure of rehydrating solution; (e) pH of rehydrating solution; and (f) rehydration under vacuum. For samples ranging in weight from 5 to 25 g., and in strips or cylinders up to 1 inch in thickness, rehydration was significantly faster and to a higher level in transverse than in longitudinal samples. The rate and level of rehydration decreased as thickness of sample increased. No appreciable difference in either rate or level of rehydration was found between similarly treated frozen-dried samples rehydrated in demineralized water at 22° C. and 55° C. Increasing hypertonicity of the rehydrating solution by addition of sodium chloride adversely affected the rehydration level. Best results were obtained with demineralized water alone. The highest level of rehydration occurred in solutions in which the pH was near 7.0, regardless of the osmotic pressure. (over) COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 4 PAGE 5 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE Authors' summary	3. 230 SECTION SAMPLING OF SALT CODFISH FOR WATER CONTENT Templemen, W. (Newfoundland Fisheries Research Station) Fisheries Research Board of Canada, Progress Reports of the Atlantic Coast Stations, No. 60, 15-19 (December 1954) The data on the section sampling of salt codfish for moisture content that are presented here give some indication of the error that may result from choosing a particular part of a salt codfish for moisture determination. The 5 fish analyzed in this study were Newfoundland light-salted cod in the usual dried state. They were obtained immediately before analysis from the large storage piles at St. Johns, Newfoundland. Seven sections were cut from the fish. (See lower part of table 1 for location of sections.) Each section was weighed, ground in a hand meat-grinder, and mixed. Duplicate mixed 50-g. samples of this mixture were dried at 220° F. to constant weight in an oven. The results of these analyses appear in table 1. The data show that the nape and tail are the driest parts and that section 2, which follows the nape, is the wettest part. The general conclusion that can be drawn from the results is that there is no substitute for the whole fish if accurate samples for moisture determination are to be obtained. (over) COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 4 PAGE 5 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Martin Heerd
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3. 5 CHEMICAL ASPECTS OF THE BROWNISH-YELLOW DISCOLORATION OF SALT COD Olafsson, Pall (Icelandic State Herringoil and Meal Factories, Siglufjörður, Iceland) Journal of Science of Food and Agriculture 5, No. 12, 589-593 (December 1954) Dry salt cod are prepared by splitting fresh cod, removing two-thirds of the back bone, washing, and then salting in stacks with an excess of salt. After the fish have been in the stacks for 3 or 4 days, they are resalted in new stacks with additional salt. After 10 days, they are resalted again. The cure is completed in about 3 weeks. This is the most commonly used method of salting fish in Iceland. Recently, the salt-cod industry in Iceland began to experience heavy losses from spoilage that is caused by a brownish-yellow discoloration. The discoloration usually occurs in 10 to 20 days after the cod have been salted in the stack. The surface of the salt-cod flesh first becomes cream or yellow-colored and then, after 3 to 6 weeks, becomes yellowish-brown or brown. This discoloration has been attributed to the use of salt unsuitable for preparing salt cod. In an attempt to determine the cause of the discoloration, the author analyzed bone-free samples of salt-cod tissue and samples of skin for moisture, calcium, and sulphate content. The salt cod for these samples were obtained from a commercial salt-curing station. The fish were first salted on board trawlers and then, after 3 weeks at sea, were resalted in the curing station. The author also performed a series of salting experiments. These were carried out as follows: fresh long-line-caught cod of fairly uniform size (about 1 1/2 kg.) were washed, split, thoroughly washed again in tap water, and then salted in the usual way in small stacks with an excess of salt. (over) COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 4 PAGE 5 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Martin Heerd	3. 230 TOP-QUALITY FISH OPERATION Shea, Philip D. (Assistant Manager, Snake River Trout Co., Buhl, Idaho) Food Engineering 27, No. 1, 80-81 (January 1955) On a Buhl, Idaho, trout farm, the trout for market are selected from live fish according to size. They are next dressed by hand, reggraded for size, and then frozen at -30° F. in aluminum trays on the shelves of an air-blast freezer in approximately 2 hours (figure 3, over). When frozen, the trout are removed from the trays and glazed in water. The average output of the freezer is 500 to 3000 pounds daily. For retail sale, the glazed fish are wrapped in cellophane, placed in window-type waxed cartons, and overwrapped with cellophane. Shipment is made in specially designed freezer cases that, if refrigerated with 10 pounds of dry ice, will keep the trout frozen for 5 to 6 days (figure 4, over). Larger shipments are hauled by refrigerated truck. Eggs from which the trout are reared are purchased at \$2.50 per 1000 from hatcheries specializing in egg production. About 500,000 eggs are required to produce 100,000 pounds of trout for market. Four pounds of fish feed costing 4 cents per pound are required to produce 1 pound of trout. The diet for these fish consists of meat products, meat scraps, non-game fish, hard wheat, cottonseed meal, fish meal, whey, brewers' yeast, and miscellaneous components such as vitamin B₁₂ and antibiotic food supplements. The Company estimates that its 1954 crop of rainbow trout will reach 500,000 pounds and that the cost to raise and market these fish will be \$300,000. (over) COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 4 PAGE 5 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Martin Heerd
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REHYDRATION OF FROZEN-DRIED TISSUE

MOISTURE ANALYSIS OF SALT COD

DISCOLORATION OF SALT COD

FRESH-FROZEN TROUT

3.5 (Cross References: 1, 5, 7, 43)

TABLE 1. Analysis of sections of Newfoundland dried light salted codfish
Water percentages of total weight of sections *

Sample No.	Size	Water percentages of total weight of sections *							True average (percent)**	
		1	2	3	4	5	6	7	Total	Whole fish
1.	Small	37.00	41.06	41.36	40.98	41.74	40.87	34.84	40.99	39.02
2.	Small	37.58	39.83	39.86	39.49	38.09	36.51	33.07	39.76	37.57
3.	Medium	42.54	41.66	41.66	41.66	41.66	41.66	41.66	41.66	39.80
4.	Medium	36.88	42.78	39.63	38.30	36.31	32.82	30.13	39.59	36.70
5.	Large	43.88	46.22	46.84	48.93	47.59	44.38	33.63	46.90	44.90
(Individual percentages plus or minus percentage moisture whole fish)										
1.	Small	-2.37	+1.49	+1.79	+1.41	+2.17	+1.30	-4.73	+1.42	-0.55
2.	Small	-0.57	+1.68	+1.21	+1.34	-0.06	-1.64	-5.08	+1.61	-0.58
3.	Medium	...	+3.04	...	+2.36	...	-3.88	...	+1.77	-0.64
4.	Medium	-0.68	+5.22	+2.07	+0.74	-1.25	-4.74	-7.43	+2.03	-0.86
5.	Large	-2.15	+0.19	+0.81	+2.90	+1.56	-1.65	-12.40	+0.87	-1.13
TOTAL		-5.97	+11.62	+5.88	+8.75	+2.42	-10.61	-29.64	+7.70	-3.76
AVERAGE		-1.19	+2.32	+1.47	+1.75	+0.61	-2.12	-7.41	+1.54	-0.75

*Sections No. 1-7. All in front of No. 2. 1/4 inch wide. 2-Neck. 3-Intermediate strip between 2 and 4. 4-1/4 inch wide strip midway between base of pectorals and anterior base of 2nd anal fin. 5-Intermediate strip between 4 and 6. 6-1/4 inch wide strip midway between base of pectorals and anterior base of 2nd anal fin. 7-End of tail. All behind No. 6.

**In individual fish averages are not of percentages but are the calculated percentage of moisture of the combined sections, allowing for the differing weight and moisture content of the sections.

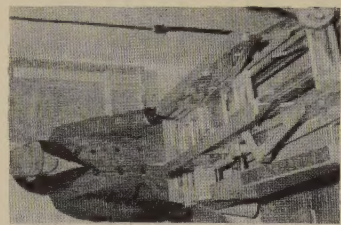
3.9

Samples of frozen-dried muscle tissue under vacuum rehydrated faster and to a higher level than samples rehydrated without vacuum.

3.230



3 TRAYS are covered, placed on freezing plates. Trout are sharp frozen at -30 F. in 2 hr.—faster if air is fan-circulated.



4 AFTER GLAZING, trout are wrapped on semi-automatic machine.

3.5

After a few days in the salt, the fish were taken up, resalted, and stored at 8° to 10°C. Fishery salts A, B, C, and D were used. The percent of calcium and sulphate, and Ca/SO₄ ratio of these fishery salts were, respectively, 0.05, 0.10, 0.50 for salt A; 0.17, 0.37, 0.46 for salt B; 0.23, 0.62, and 0.37 for salt C; and 0.06, 0.14, 0.43 for salt D. The salt cod were examined for discoloration after 7 to 10 days, 12 to 14 days, 35 days, and 42 days.

The calcium content of brownish-yellow salt-cod tissue was found to be considerably higher than the calcium content of ordinary salt-cod tissue. Calcium in excess of sulphate was higher in the discolored tissue. The sulphate content of the salt in the stacks of deteriorated fish was reduced, and the ratio Ca/SO₄ was increased. If calcium was added to the salts that cause discoloration, the appearance of the discoloration was accelerated. Sterilization of the salt suppressed the cause of discoloration.

Calcium-requiring halophilic microorganisms are believed to play a prominent role in the discoloration of salt fish. These microorganisms are believed to be transferred mainly by the salt.

3. 249 COEFFICIENTS OF EVAPORATION OF ICE AND FROZEN MEAT IN REFRIGERATED WAREHOUSES Rjutoff, D. Cholodilnaya Technica 31, No. 2 (April-June 1954) The loss of weight in frozen products obeys the laws of surface evaporation, which differ markedly from those regulating drying processes at temperatures above the freezing point. Within a frozen product there is practically no moisture migration. During storage a steadily increasing layer of spongy dehydrated tissue is formed on the surface of frozen meat. The moisture content within this layer depends on the temperature and on the corresponding percentage of ice formed during freezing. The respective values, based on 100 percent relative humidity, are represented in table 1 (this card, over). At lower relative humidities the moisture content in the surface layer decreases. At 14° F. and a relative humidity of 90 percent it reaches 24.8 percent. The weight of moisture w evaporating during one hour is $w = \beta S (p_M - \phi p) \quad (1)$ In this equation β is the coefficient of evaporation measured in grams per hour per square meter of surface and per millimeter of mercury, S is the meat surface in square meters, p_M the saturation vapor pressure at the temperature of meat surface, p the saturation vapor pressure at the temperature of the ambient air, both measured in millimeters of mercury, and 100ϕ is the relative humidity in percent. From the heat balance of the evaporating process the following equation can be derived $Q = (h_c + h_r) (t - t_N) S = L \beta S (p_M - \phi p) \quad (2)$ (over) COMMERCIAL FISHERIES ABSTRACTS VOL VIII NO. 4 PAGE 7 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE November 1954. R. Plank was the abstractor.)	3. 231 THE CAUSE, PREVENTION, AND CORRECTION OF FROST HEAVING IN FROZEN FOOD WAREHOUSES Anonymous Frosted Food Field 20, No. 1, 28 (January 1955) Cause. -- The cause of floor heavage is the cumulative effect of ice pockets growing and expanding under the floor. (Illustration on back of card.) This action creates pressures that erupt the floor, lift support columns, and progressively destroy the building. Prevention. -- The positive way to prevent floor heavage is to add heat artificially to the soil beneath the floor. This addition is normally taken care of in new construction by building pipe grids for circulation of warm fluids or by laying tile or duct for circulation of air. Correction. -- In older construction not already provided with heating units, the following basic methods for installing the units are employed: 1. Pushing pipes horizontally under the floor and inserting heater elements in the pipes. 2. Inserting pipes vertically down through the floor slab and placing heating elements at the proper level in the pipes. The latter method is used only where the location of the building makes the first method impractical. Installation of the first method is custom designed, and different techniques are used for inserting the pipe. In some locations, a hydraulic jack backed up with cribbing is used. In other locations, the best technique may be to drill or to use a water lance located inside the pipe. (over) COMMERCIAL FISHERIES ABSTRACTS VOL VIII NO. 4 PAGE 7 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: F. Bruce Sanford
3. 2 THE ORGANIZATION OF A QUALITY CONTROL PROGRAM IN A FISHERY PLANT Hampton, W. F. (General Foods Corporation, Boston, Massachusetts) Canadian Fisherman 42, No. 1, 14-15 (January 1955) In the organization of a quality-control program, the following steps should be taken: (1) Product standards and specifications should be established. (2) Procedures and specifications should be worked out covering the method of making the product. (3) A system of operating controls and checks should be installed. (4) A system of reporting and follow-up should be established. Product specifications. -- Ordinarily, the attributes to be specified are flavor, odor, texture, color, size, net weight, and number of pieces per group. Specifications should be reduced to writing. The best method of doing this is to prepare an Operating Manual, which covers all product and process specifications, quality control procedures, and checks. This manual should be as complete with detail as it can be made. One such manual in the author's organization comprises a loose-leaf book of closely typewritten pages over an inch thick. Process specifications. -- The process specifications should define the process completely, and it should indicate the degree of variation that is permissible at various stages in the operation. Process specifications should include an accurate description of the raw material used and of the manner in which it should be handled. An important part of the program is the training of operating personnel. Time should be taken to explain carefully to each man his duties and his share of the responsibility. (over) COMMERCIAL FISHERIES ABSTRACTS VOL VIII NO. 4 PAGE 7 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: F. Bruce Sanford	3. 23 AUTOMATIC BREADING AND FRYING LINE Anonymous Food Processing 16, No. 1, 60-62 (January 1955) A fully automatic line has been developed for feeding, dipping, breading, frying, and stacking fish and other seafoods. Feed table. -- The fish is placed by hand on a moving belt that feeds the fish into the dipping machine at a uniform rate. Dipping machine. -- Batter contained in the dip pan is pumped to a distributor on top of the unit. The mix fills a small reservoir positioned over the conveyor, and the overflow forms a curtain of batter through which the product passes and becomes uniformly coated on all sides. A blower provides a mild air blast for the removal of excess batter, which runs to the dip pan, passes through a sieve, and recirculates back to the distributor. Breader. -- The breader consists of a revolving drum in which the fish is uniformly coated with the breader mix by a gentle tumbling action. Infed conveyor. -- The infed conveyor is provided with a vibrating chute, which removes excess breader mix. Fryer. -- A conveyor passes the fish through the fryer at a steady pace for complete and uniform cooking at 375° F. The immersion time in the cooking fat is variable from 1/2 to 5 1/2 minutes. A circulating system maintains the fat at a constant level. (over) COMMERCIAL FISHERIES ABSTRACTS VOL VIII NO. 4 PAGE 7 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: F. Bruce Sanford

MOISTURE LOSS FROM FROZEN MEATS

QUALITY-CONTROL PROGRAM

ELIMINATION OF FROST HEAVING

AUTOMATIC BREADING AND FRYING LINE

Operating Checks. -- After the specifications for the product and for the process by which it is to be made have been determined, the next step is to install a system of checks on actual performance. These consist of checks on the product at various key points as well as at the terminus of the line. Samples should be examined at intervals throughout the production period. The testing procedure may include physical examination or microbiological examination as well as subjective tests for such factors as odor, taste, texture, and color.

A recorder chart on a retort in a canning operation provides a good example of a check made on the performance of a given step in the production line. Other line checks may be on precook temperatures and sealing machine performance. In the production of frozen filets, there will be checks on such factors as blemishes, and the freezing time and temperature used.

Report and follow-up. -- The test data are arranged in report form and submitted to the front office. When the need for action is indicated in these reports, it is good practice to place the responsibility for this action directly with the production department or with the management. In this way, the function of the quality-control department becomes one of making the necessary inspections, according to a prearranged plan, and reporting these to the proper authority in the plant.

Advantages. -- Quality control helps to keep errors, waste, and inefficiency at a minimum, improves plant operations, and lowers production costs. The author points out that any production business takes unnecessary chances with its future if it does not have a quality-control program.

Here Q is the heat in kilocalories per hour transferred from the air to the meat; h_c and h_r are the film coefficients of heat transfer by convection and by radiation in kilocalories per hour, per square meter, and per degree C; t and t_n are the temperatures of the air and of the meat in degrees C; and L is the latent heat of sublimation of ice in kilocalories per gram.

The pressure-temperature curve between -5° and -22°C . is represented by the equation

$$p = 84.8 / (12.5 - t) - 1.833 \text{ mm. of Hg} \quad (3)$$

From Equations 1 to 3 the expression can be derived

$$w = \beta S \frac{M}{p(1 - \phi)}$$

$$(4) \quad \text{in which} \quad M = 1 + \frac{\{h_c \beta L (1 + h_r/h_c) (12.5 - t)\}^2}{84.8}$$

is called the "psychrometric factor." The author gives the following numerical values for the different quantities contained in Equation 5: $h_c/\beta = 0.42$ for frozen meat of medium quality; $h_r = 3.57 (1 + 0.01 t)$; $L = 0.678$; and $h_c = 2.60 \sqrt{v/d}$ expressed in the units mentioned above. In addition v is the air velocity in meters per second at the meat surface, and d in meters is the equivalent diameter of the meat. For most practical applications M has a value from 1.05 to 1.25. The coefficient of evaporation in Equation 4

$$\beta = \frac{w}{S p (1 - \phi)}$$

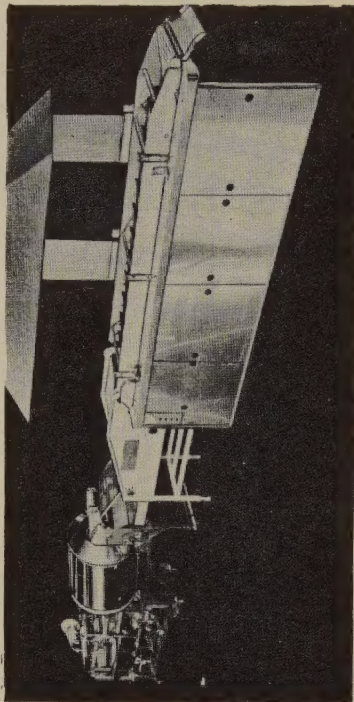
is most important for evaluating the losses of foodstuffs by dehydration during cold storage. Values of β have never been determined exactly. The mean values for meat quarters at a cold storage temperature of -8.3°C . are

$$\begin{aligned} \beta &= 3.0 \text{ for fat meat} \\ \beta &= 3.9 \text{ for medium quality meat} \\ \beta &= 5.1 \text{ for lean meat} \end{aligned}$$

Table 1

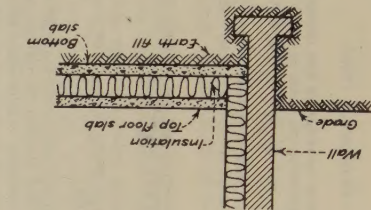
Meat temp p	Ice formed during freezing, %	Moisture content in surface layer, %
30.6	0	76.0
27.5	62.5	53.5
22.5	80.5	38.2
18.5	80.5	34.1
14.0	83.7	30.8
9.5	86.0	28.6
5.0	88.5	26.2
0.5	89.4	23.4
-4.0	90.4	22.1
-13.0	91.0	
-22.0		

Automatic stacker. -- The fish is deposited on a stacker conveyor and transported into position for automatic stacking on trays. As the trays are filled, they are removed and placed in racks for cooling.



As can be seen from the accompanying table, the selection of heating units in respect to arrangement and capacity is usually such as to lower the floor in about 2 to 3 months.

Room	Heat Applied	Time to Lower
A Food Locker	470	60 days
B Food Locker	1,600	58 days
C Dairy Freezer	25,200	75 days est.
D Dairy Freezer	30,400	75 days
E Frozen Food Plant	3,600	75 days
F Frozen Food Plant	1,200	85 days
	3,200	6,528
	4,200	7,560
	18,720	33,264
	54,720	2,304
	Total	85 days



The usual design of freezing-room floor consists of two concrete slabs separated by a thick layer of insulation.



Freezing temperature in the ground causes ice to form in the solid layers that raise and rupture floor slabs.

1.1 FACTS AND FIGURES ON THE TUNA INDUSTRY Morris, E. L. Pan American Fisherman 9, No. 6, 10-11 (January 1955) History. -- The tuna canning industry in this country dates back to 1903 when a few fishing vessels and one cannery in the Los Angeles area produced 700 cases. Initial sales were slow even at the price of \$3.50 per case. Albacore was the only species packed. By 1915, however, the canneries were processing yellowfin and skipjack. Albacore remained the dominant species until 1926, when they disappeared from the coastal waters. In the following year, the catch south of the border exceeded that off California. The longer voyages southward required many changes in the method of operation. Ice was carried in insulated holds, the crews' quarters were enlarged, and diesel engines replaced gasoline. By 1935, the demand for tuna reached a high, which lead to the development of the modern tuna clipper. The evolution of the fishing fleet was interrupted by World War II, when 80 percent of the clippers found service with the Navy. War-time losses were not fully replaced until 1948. The fleet. -- Three fleets serve the southern California canneries: (1) tuna clippers, (2) purse seiners, and (3) small albacore boats. The clipper fleet is based at San Diego and consists of about 200 vessels, each with a capacity of from 100 to 500 tons. The species fished for are yellowfin and skipjack. Yellowfin grow to a weight of 100 pounds; skipjack average only 5 to 15 pounds. They are caught by hook and line after first being attracted close to the vessel by live bait. The clipper fleet accounts for 70 percent of the tuna landed by American fishermen. (over) COMMERCIAL FISHERIES ABSTRACTS VOL VIII NO. 4 PAGE 9 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: F. Bruce Sanford	1.85 SNAP FROZEN PRAWNS Anonymous Food Manufacture XXX, No. 1, 1 (January 1955) Australians are developing quite a taste for prawns and, in view of the huge distances in that country, the task of getting this delicacy to market sets some problems. The answer is 'snap freezing.' Frozen prawns and fish have been successfully transported by refrigerated road transport from the Richmond River Fishermen's Co-operative fish freezing works at Ballina, New South Wales, to Melbourne, a distance of 1,090 miles. The prawns are snap frozen in 4 lb. blocks and seven blocks go to a carton. The snap freezing machine is of English make and is the first Jackstone plate freezer to operate in Australia on fish and prawns. This machine produces a pack identical with imported English filets. An Australian-wide organisation, Frigmobile Pty., Ltd., arranged for a refrigerated road truck to carry the product to Sydney and on to Melbourne. The truck, which has its own refrigerating equipment, carried a gross load of 12 tons, and held the product at 0° F. Up to the present the Co-operative company has frozen cooked prawns, cooked king prawns, king prawn cutlets, uncooked garfish filets, skinned and boned black bream filets, and boned sea mullet filets. When the processed products are thawed, it is impossible to tell them from fresh, and the flavour is retained completely. Reprinted in whole COMMERCIAL FISHERIES ABSTRACTS VOL VIII NO. 4 PAGE 8 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE
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1.1 THE BIRTH OF A FISHERY McKernan, Donald L. (U. S. Fish and Wildlife Service, Honolulu, Hawaii) Progressive Fish Culturist 17, No. 1, 42-43 (January 1955) The Pacific Oceanic Fishery Investigations, a unit of the U. S. Fish and Wildlife Service with headquarters in Honolulu, has been investigating the potential fishery resources of the central Pacific, an area of nearly 7,000,000 square miles. Efforts have been concentrated on (1) locating oceanic areas with favorable conditions for biological productivity and (2) systematically searching these areas for concentrations of fish. Two research methods are being used to attain these objectives: (1) Biological and physical oceanography are depended upon to define the regions of potential productivity. (2) The fish populations are sampled by the use of accepted commercial fishing techniques as well as by the use of biological sampling methods necessary for capturing the smaller, more elusive fishes. By the use of these methods, evidence has been found of upwelling associated with a divergence at or near the equator about 1200 miles south of Hawaii. This upwelling enriches the euphotic zone by bringing inorganic salts from the deeper waters. Plankton and midwater trawl samples from the area contain unusually large amounts of organisms. Experimental fishing showed an extensive concentration of yellowfin tuna, its center of abundance lying in a band from 140° to 170° W. longitude and from the equator to 5° N. latitude, an area of about 500,000 square miles. (over) COMMERCIAL FISHERIES ABSTRACTS VOL VIII NO. 4 PAGE 9 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: F. Bruce Sanford	1.5 COD -- THE BEEF OF THE SEA Cutting, C. L. (Food Investigation Organization, Humber Laboratory, Hull, D. S. I. R.) Food Manufacture 30, No. 1, 11-15 (January 1955) Ancient Egyptians and Babylonians and later the Greeks and Romans preserved fish against bacterial decomposition by drying and salting. It was not until the Middle Ages, however, that the basic techniques of preservation, still current today, were developed in Fendal Europe to take advantage of the abundance of cod, other white fish, and herring. Medieval transport by sail and by packhorse meant that only heavily preserved fish could reach consumers living outside of the actual fishing ports. Stockfish was prepared mainly in Iceland and Norway. The climate along the middle of the coastline of Norway, with its cold, dry spring and abundance of sunshine, is ideal for stockfish preparation. This product was handled by German merchants from the twelfth century onwards. About 1350, these merchants established the Hanseatic League, with a branch office at Bergen on what was known, until 1945, as the Tøsse brygge (German Quay). Iceland, originally a Norse settlement, became isolated first from Denmark and then from Norway as a result of the Hanseatic League activity in Bergen. When English fishermen looking for new fishing grounds and English merchants looking for new markets ventured to Iceland about 1412, they were at first welcomed. Eventually, however, both the Icelandic fishery and the trade were hampered by the Danish King who tried to assert his sovereignty. With the discovery of Newfoundland by Cabot in 1497, Britain had access to a new source of fish and had no further need for Icelandic trade. About this time, an interest in the white fish in the waters of the British Isles and of Scotland, in particular, was revived. Cod were salted and dried in the traditional manner; that is, they were gutted, split, (over) COMMERCIAL FISHERIES ABSTRACTS VOL VIII NO. 4 PAGE 9 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Martin Heerdt
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THE TUNA FLEET

AUSTRALIAN FROZEN PRAWNS

TUNA IN THE CENTRAL PACIFIC OCEAN

HISTORY OF THE COD FISHERY

1.1 (Cross Reference: 2.11) The purse-seine fleet is based at San Pedro and consists of about 170 vessels. As most of these have a limited range, they are largely confined to fishing the coastal area. In purse seining, a net is towed by rowboat in a circle around the school of tuna. A chain loops through the net and acts as a drawstring to enclose the fish in a purse-like pocket. Accordingly, the purse seiners are most active during the months when the fish swim in schools. The fleet accounts for 20 percent of the American landings. The small albacore boats operate along the coast and total about 3000 vessels, which range from 25 to 60 feet in length. Those less than 40 feet have 1 or 2 men in the crew; those larger have 2 to 5 men. Two methods are used to capture the albacore (which grow to a weight of 55 to 60 pounds): bait fishing and trolling, with the bait fishing being done only by the larger vessels. Operations are carried on during summer and fall when the albacore are running. The fleet of small boats accounts for 10 percent of the American landings. Share system. -- Fishermen on tuna clippers are paid by share as follows: Out of the total receipts (about \$100,000 per trip for a 300-ton vessel costing up to \$500,000 to build), the trip expenses (fuel, food, licenses, and minor supplies and repairs -- all of which total about \$12,000 to \$15,000) are deducted. The rest is then split approximately 50-50 between the vessel owner and the crew of 15 to 18 members. Ordinarily, a clipper will average about 3 trips per year of 3 months' duration each.	1.5 salted, and laid out to dry on stony beaches. "Well-vessels" with a large tank amidships in which holes had been bored to allow free circulation of sea water were introduced from Holland at Harwich and Barking in 1712. For the London market, these vessels landed live fish at Billingsgate, which became one of Britain's leading ports and remained as such until about 1900. At Harwich and, later, at Grimsby, the fish were taken from the vessel well and kept in floating wells in the harbor for a week or two without adverse effect. Fishing by dragging a net over the sea bed was probably introduced from the Zuider Zee in the eighteenth century. Efficient trawl fishing methods suitable for the open sea were developed by the men of Barking and Brixham. In the second half of the last century, the combination of trawling, ice, and rapid transport by rail eventually converted fish from an expensive luxury into a staple food.
1.1 (Cross Reference: 2.11) The small albacore boats operate along the coast and total about 3000 vessels, which range from 25 to 60 feet in length. Those less than 40 feet have 1 or 2 men in the crew; those larger have 2 to 5 men. Two methods are used to capture the albacore (which grow to a weight of 55 to 60 pounds): bait fishing and trolling, with the bait fishing being done only by the larger vessels. Operations are carried on during summer and fall when the albacore are running. The fleet of small boats accounts for 10 percent of the American landings. Share system. -- Fishermen on tuna clippers are paid by share as follows: Out of the total receipts (about \$100,000 per trip for a 300-ton vessel costing up to \$500,000 to build), the trip expenses (fuel, food, licenses, and minor supplies and repairs -- all of which total about \$12,000 to \$15,000) are deducted. The rest is then split approximately 50-50 between the vessel owner and the crew of 15 to 18 members. Ordinarily, a clipper will average about 3 trips per year of 3 months' duration each.	1.1 (Cross Reference: 1.0112) Although the long line method of fishing has been used successfully for sampling yellowfin, only an occasional skipjack is taken by this gear. However, studies of tuna eggs and larvae indicates that skipjack are present in even greater numbers than are the yellowfin. The development of a commercial fishery is now being encouraged. During the last spring, two west coast vessels took 210 tons of yellowfin from the Line Islands region, using the long-line method of fishing. In August 1954, three Pacific Northwest vessels were long-line fishing in that area. Although the potential yield is unknown, a comparison of the area of the belt along the equator with the area used by the present American fishery off Mexico and Central America, which supports a \$125,000,000 industry, indicates a likelihood that full utilization of the tunas from the central Pacific would produce a like amount. The author points out that there are other regions in the tropic and subtropical Pacific Ocean that, because of unique oceanographic conditions, will probably prove unusually productive of fish. For example, islands jutting up from the bottom of the ocean and interrupting the flow of major currents apparently cause enrichment of surrounding surface waters. Also, north of the Hawaiian Islands at the boundary between the easterly flowing North Pacific Drift and the westerly flowing North Equatorial Current is a region of turbulence and eddies that shows promise of great biological productivity. Investigations are now under way to find and chart these favorable environments and to evaluate their potential fishery resources.

3. 230 VOLUNTARY FEDERAL GRADE STANDARDS FOR STICKS -- CONTINUING RESEARCH DRAWS THE GUIDE LINES Butler, Charles (U. S. Fish and Wildlife Service, Washington, D. C.) Quick Frozen Foods <u>17</u>, No. 6, 70-71 (January 1956) The Technology Section research program includes a project entitled "Fish Sticks -- Storage Characteristics and Quality Standards." Among the variables under study are the effect on the final product of species of fish; state of freshness of fish raw material; kind and amount of batter and breading mixtures, frying technique, including type of oil used, its temperature, the frying time, and the oil replacement rate; packaging materials and methods; and freezing and frozen-storage conditions. It is too early to be sure of all of the essential details of the research results, for much work remains to be done. However, certain guide lines can be established in the drafting of a voluntary Federal standard for fish sticks: (1) The product should be defined. (2) The product unit size should be designated. (3) The grade nomenclature should be established. The following is a generalized draft: Definition of fish sticks. -- Items made by battering and breading uniform, rectangular, elongated pieces of fish flesh from the species indicated on the label, deep fried in a suitable oil. (Some statement of the acceptable range in percentage of breading material on the sticks would necessarily be a part of the definition, but as yet there are not sufficient data for a recommendation of this range). Product unit size. -- A fish stick, as defined, with a gross weight per unit of one ounce (alternative sizes would be covered). (over) COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 4 PAGE 11 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: F. Bruce Sanford	3. 230 TESTS DETERMINE RANGE OF BREADER PICKUP Umpleby, J.; Placusa, B.; and Block, Z. (Doughnut Corporation of America) Quick Frozen Foods <u>17</u>, No. 6, 63, 68-69 (January 1956) To determine (1) the weight gain on breading, (2) the amount of fat absorbed on frying, (3) the moisture loss on frying, (4) the moisture loss on cooling, and (5) the over-all pickup, the authors conducted experiments under two sets of conditions, which they called "optimal" and "minimal." These conditions were as follows: Optimal Fish sticks at -10° F. Careful, full coating of sticks 75 seconds frying at 365° - 375° F. Minimal Stored batter Wet, lumpy breader Deteriorated frying fat The following results were obtained under the optimal conditions: 1. The weight gain on breading was 34 - 39 percent of the weight of the raw fish stick. (over) COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 4 PAGE 11 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: F. Bruce Sanford
3. 12 EXPERIMENTS ON STORING MILD-CURED WHALE MEAT WITH ANTISEPTICS Yanada, Haruo; Akitsugu, Elzaburo; Takagi, Shoji; and Taguchi, Yoshihiko Repts. Japan. Marine Products Co. Research Lab., No. 5, 9-13 (1952) Chemical Abstracts <u>48</u>, No. 22, 14023 (1954) I. Capric acid and ethyl p-hydroxybenzoate Blue whale meat cured in 16.3 - 20% brine with or without adding 0.01% Me(CH₂)₈ - CO₂H and (or) p-OHC₆H₄CO₂Et in Antarctica, upon examing. in Japan 2 months later, showed the surface moldy and putrefied, but the interior passably preserved (better with the antiseptics), but totally putrefied in 70 days. From the basic volatile N acid, the meat was putrefied less than the brine, perhaps because of the blood mixed in it. II. Furacin Furacin (5-nitro-2-furfural semicarbazone) similarly added to 0.003% of meat (0.025% of brine) preserved the meat well. III. Method of curing whale meat with Furacin In the meat salted by pickle method 0.01% Furacin was slightly effective, but not 0.004%. By the dry salt method 0.01% Furacin was effective. For longer storage the pickled meat was better preserved than the dry-salted meat. COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 4 PAGE 11 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE Reprinted in whole VOLUNTARY STANDARDS FOR FISH STICKS MILD-CURED WHALE MEAT	3. 18 APPLICATIONS OF CHLORINE GAS FEEDING IN THE FISH PROCESSING INDUSTRY Pearce, R. W. (Builders-Providence, Inc., Providence, R. I.) Canadian Fisherman <u>42</u>, No. 1, 6-10 (January 1955) Chlorination is used to disinfect fresh water, control slime formation in condenser water, disinfect clean-up water, and aid in the prevention of fish spoilage. The amounts of chlorine used vary from 3 parts per million to possibly 40 parts per million for salt-water chlorination. The simplest and safest way to add chlorine for various uses is by a chlorine gas feeder. The construction of such a feeder and its principles of operation depend largely on the properties of chlorine. Cool dry chlorine is inert to metals. Moist chlorine is extremely corrosive. Another fact of importance is that chlorine has low solubility. Thus, some means is needed for incorporating the chlorine into water, since the direct use of the gas is seldom if ever practicable. There are 4 types of chlorine-gas feeders: (1) Direct feed type. -- Chlorine under pressure is delivered directly to the point of application. (2) Solution type. -- Chlorine is dissolved with a minimum amount of water in an injector or educator and delivered in solution to the point of application. (3) Semi-vacuum type. -- This is a solution-type feeder in which the system is maintained under vacuum during the time the educator is in operation. If the vacuum fails, chlorine will continue to flow through the system, as there is no automatic shut-off on loss of vacuum. (4) Full-vacuum type. -- This is a solution-type feeder in which chlorine is maintained under vacuum throughout the apparatus. An ejector is employed into which the gas is drawn to provide (over) COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 4 PAGE 11 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: F. Bruce Sanford TESTS ON AMOUNT OF BREADER PICKUP CHLORINE GAS-FEEDERS

3.18

solution feed and create the vacuum. In this feeder, the vacuum governs the operation of the chlorine inlet valve directly or indirectly so that the chlorine will not feed unless sufficient vacuum is induced through the apparatus. The safe operation of this type of feeder is assured because the flow of chlorine is automatically shut off on loss of vacuum, stoppage of discharge line, or loss of operating water pressure.

A chlorine-gas feeder operates on the principle of regulating flow by controlling conditions existing upstream and downstream from an orifice in a flow line. This orifice may be constant or variable. Various additional refinements are incorporated in the feeder, but these refinements do not alter the basic principle.

The evolution of the design of chlorine feeders is shown in the accompanying figure.

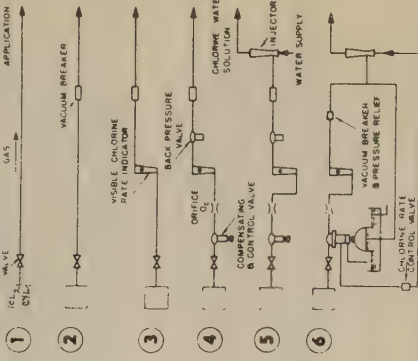


Fig. 2. Evolution of Chlorine Feeder Design

3.230 (Cross Reference: 8.7)

Grade nomenclature and definitions. -- To be of quality AA, the product is of a uniformly golden-brown color; and after heating, not over 10%, by count, of the units may vary markedly from the predominating color. The odor and flavor shall be that characteristic of good-quality fish of the species, fried in a suitable oil. Product shall be uniform as to size, with not more than 10%, by count, of the units consisting of non-uniform or misshaped pieces; no broken pieces.

No carbon specks, bones, skin or scales may be present. Good texture of the product shall include moderately crisp exterior surfaces, no noticeable separation of the breading from the fish portion, and no excessively moist or oily condition in the breaded layer; the fish flesh shall be well cooked, tender, and practically free from sogginess.

A point range in the grading scale would be assigned these major attributes. For example, fish sticks that possess good color may be given a score of 17 to 20 points on this attribute. Those having good odor and flavor would score 26 to 30 points. Acceptable texture of these fish sticks would result in a score in the point range 17 to 20. A total score of not less than 90 points would be required.

To be of A quality, the product differs from Grade AA essentially in that the term "good" is replaced by "reasonably good." Not over 20%, by count, of the units may vary from the predominating color; not over 20% of the units may be of non-uniform or misshaped pieces, with no broken pieces. Exterior surfaces may contain no carbon specks. Texture is slightly less desirable than in Grade AA but is still reasonably good.

The point ranges in this grade might be color -- 13 to 16; odor and flavor -- 23 to 26; defects -- 22 to 25; and texture -- 13 to 16. Minimum total score would be 78.

The remaining grades for fish sticks might be similarly set up, possibly with grade B at a score of not less than 60. Any product rating not over 35 would fall into grade C.

3.230 (Cross Reference: 8.7)

2. The amount of fat absorbed on frying was about 8 percent.
3. The moisture loss on frying was 8 - 9 percent.
4. The moisture loss on cooling was 1 - 2 percent.
5. The over-all pickup was 29 - 35 percent.

There was no significant difference between the optimal conditions and the minimal conditions as to the amount of fat absorbed on frying or the amount of moisture lost on cooling. However, the moisture lost on frying was significantly less and the weight gain on breading and the over-all pickup were significantly greater under the optimal conditions than under the minimal conditions.

The data are summarized in the accompanying table.

	OPTIMAL		MINIMAL	
	I	II	I	II
Number of Sticks	50	50	50	50
Wt. Raw Sticks*	1002	1010	1007	958
Wt. Breaded Sticks	1348	1401	1310	1258
% Gain	34.5%	38.7%	30.1%	31.3%
Wt. Fried	1339	1405	1224	1212
% Gain	33.8%	38.1%	22.5%	25.5%
Wt. Fat Absorbed	81.3	85.0	82 (45 FFA)	89.3 (79 FFA)
% Fat Absorbed	6.1%	8.4%	8.1%	9.3%
Wt. H ₂ O Lost	80.5	84.5	158	135
% H ₂ O Lost	8.0	8.4	15.7	14.1
Wt. After Cooling	1292	1385	1191	1176
For Drainage	21	21	15	15
Wt. H ₂ O Lost (cooling)	28	19	28	15
% H ₂ O Lost (cooling)	2%	1.3%	2.3%	1.2%
Overall "Pickup"	29%	35%	18.9%	23%

*All weights are given in grams

4. 12 SOME INVESTIGATIONS WITH LONG CHAIN COMPOUNDS. DEHYDRO-POLYMERIZATION OF LONG CHAIN COMPOUNDS WITH DI-<u>TERT</u>-BUTYL PEROXIDE Sutton, D. A. (National Research Laboratory, Pretoria, South Africa) Journal of the American Oil Chemists' Society <u>32</u>, No. 1, 20-21 (January 1955) Di-<u>tert</u>. butyl peroxide reacted with hydrocarbons and related compounds, such as saturated and unsaturated fatty acids, with the formation of dehydro-polymers and <u>tert</u>. butyl alcohol. The main characteristic of the reaction was the removal of hydrogen atoms from the alkyl chain, with the formation of a linkage between two molecules of peroxide reduced. In the case of 1-enes, a double bond polymerization was catalyzed so that a higher ratio of intermolecular linkages existed and a proportion of the original double bonds were used up. The formation of dimeric acids from monomeric drying-oil acids and di-<u>tert</u>. butyl peroxide has commercial possibilities, since the original unsaturation should be retained to subsequent advantage in uses requiring drying properties. Another advantage is that saturated and mono-unsaturated acids would also dimerize. Dehydro-polymerization is superior to thermal polymerization in that, theoretically, no double bonds are destroyed by the peroxide reaction. The reactions of methyl linoleate and methyl stearate with di-<u>tert</u>. butyl peroxide were studied. The formation of methyl linoleate mixed dehydro-dimer isomers was accompanied by rearrangement of a substantial proportion of the pentadiene groups, with the formation of conjugated dienes. Higher dehydro-polymers were also formed, and these, too, contained conjugated diene. Use of a high proportion of peroxide to linoleate resulted in the formation of gels containing rubbery ether-insoluble (over) COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 4 PAGE 13 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: W. N. Sumerwell	4. 13 SOME INVESTIGATIONS WITH LONG CHAIN COMPOUNDS. SOUTH AFRICAN PILCHARD OIL Sutton, D. A. (National Chemical Research Laboratory, Pretoria, South Africa) Journal of the American Oil Chemists' Society <u>32</u>, No. 1, 18 (January 1955) Data on the approximate gross over-all compositions of fish-body oils are readily available. However, knowledge of their precise structural chemistry is limited, owing to the fact that the highly unsaturated fatty acids, which are characteristic of fish oils, are liable to structural alteration during vacuum distillation. In recent years, there has been increasing use of milder separation methods, such as urea-complex fractionation and elution chromatography. In the research on South African pilchard oil, the classical lithium salt separation of Tsjimoto, as a group, was compared with the use of repetitive urea-complex fractionation and with the result of using the two procedures in sequence. It was found that a combination of lithium salt-acetone segregation, 3-stage molecular distillation, and urea-complex fractionation gave sub-fractions with a comparatively small number of components. The molecular-distillation step was accomplished by the use of a 3-stage refractonating falling-film molecular still, which was designed and constructed for the purpose. The final resolution of the sub-fractions was made by use of reversed-phase chromatography. The application of these procedures to South African pilchard oil has led to the isolation of the all-<u>cis</u> form of hexadeca-6-9-12-15-tetraenoic acid. A second new acid has been isolated in a less (over) COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 4 PAGE 13 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: W. N. Sumerwell
4. 10 SOME INVESTIGATIONS WITH LONG CHAIN COMPOUNDS. THERMAL POLYMERIZATION OF TRIGLYCERIDE OILS Sutton, D. A. (National Research Laboratory, Pretoria, South Africa) Journal of the American Oil Chemists' Society <u>32</u>, No. 1, 19-20 (January 1955) Thermal treatment of unsaturated triglyceride oils results in the formation of covalent links between fatty acid chains so that polymers of the original triglycerides are formed. Saponification of the polymeric triglyceride mixtures yields monomeric acids, dimeric acids, and smaller amounts of trimeric (and higher) acids. The triglyceride oils that are used industrially for conversion to "stand" or thermally polymerized oils contain dienes or trienes either of the conjugated or of the methylene-interrupted type. Two theories have been advanced to explain thermal polymerization. According to one theory, the conjugated-type fatty acid dimerizes, on heating, by 1:4 addition to a double bond in another molecule. The unconjugated fatty acids first isomerize to conjugated form on heating and then undergo the same 1:4 addition. Thus, the linkage formed consists of a cyclo-hexene ring substituted in 4 neighboring positions. A second theory proposes that a hydrogen-separation reaction is responsible for linkage. A double bond in one molecule opens to receive at one end a hydrogen atom from a methylene group in another molecule. The other end of the double bond becomes joined to the methylene group. A single covalent bond is formed. The 1:4 addition theory for thermal polymerization of conjugated fatty acids was confirmed by a study of the addition of maleic anhydride to methyl β-elaeostearate. The reaction gave the expected (over) COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 4 PAGE 13 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: W. N. Sumerwell	4. 13 SOME INVESTIGATIONS WITH LONG CHAIN COMPOUNDS. SOUTH AFRICAN PILCHARD OIL Sutton, D. A. (National Chemical Research Laboratory, Pretoria, South Africa) Journal of the American Oil Chemists' Society <u>32</u>, No. 1, 18 (January 1955) Data on the approximate gross over-all compositions of fish-body oils are readily available. However, knowledge of their precise structural chemistry is limited, owing to the fact that the highly unsaturated fatty acids, which are characteristic of fish oils, are liable to structural alteration during vacuum distillation. In recent years, there has been increasing use of milder separation methods, such as urea-complex fractionation and elution chromatography. In the research on South African pilchard oil, the classical lithium salt separation of Tsjimoto, as a group, was compared with the use of repetitive urea-complex fractionation and with the result of using the two procedures in sequence. It was found that a combination of lithium salt-acetone segregation, 3-stage molecular distillation, and urea-complex fractionation gave sub-fractions with a comparatively small number of components. The molecular-distillation step was accomplished by the use of a 3-stage refractonating falling-film molecular still, which was designed and constructed for the purpose. The final resolution of the sub-fractions was made by use of reversed-phase chromatography. The application of these procedures to South African pilchard oil has led to the isolation of the all-<u>cis</u> form of hexadeca-6-9-12-15-tetraenoic acid. A second new acid has been isolated in a less (over) COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 4 PAGE 13 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: W. N. Sumerwell

DEHYDRO-POLYMERIZATION OF FATTY ACIDS

AUTOXIDATION OF FATTY ACID ESTERS

THERMAL POLYMERIZATION OF OILS

AFRICAN PILCHARD OIL FATTY ACIDS

4.12 (Cross Reference: 4.5)

Lipoxidase-catalyzed oxidation of linoleate

Studies on the various conditions of oxidation and factors involved in the recovery and isolation of the peroxides indicate that the course and mechanism of lipoxidase-catalyzed oxidation of sodium linoleate are different from those operating in the autooxidation of methyl linoleate.

Chemical and spectral analyses indicate that the initially formed hydroperoxides in the lipoxidase-catalyzed oxidation of sodium linoleate contain a *cis*, *trans* diene-conjugated system of double bonds; *trans*, *trans* conjugation, when observed, probably occurs as a secondary reaction in the process of recovery or isolation.

Polymers found in the low-temperature lipoxidase-catalyzed oxidation of sodium linoleate appear to be formed by oxidative reaction and not by chemical decomposition of the peroxides.

Reduced peroxide concentrates isolated from the lipoxidase-catalyzed oxidation of sodium linoleate are optically active, suggesting that the enzyme is involved in the formation of each peroxide molecule.

Lipoxidase showed no activity when sodium *cis*-9, *trans*-12-linoleate was used as the substrate.

Polarographic analysis of peroxide concentrates, isolated from the lipoxidase-catalyzed oxidation of linoleate, indicate that whereas hydroperoxides are formed initially, they are readily transformed to peroxides of a different structure when allowed to stand at room temperature or above for a prolonged period.

4.12

fractions, presumably consisting of cross-linked networks.

Methyl stearate also reacted to form dehydro-dimers and higher dehydro-polymers.

A patent has been obtained on the use of di-tert. butyl peroxide as a polymerization catalyst.

4.13

pure state.

The columns used for the chromatographic separations were equivalent in separative power to 600 Craig transfers or more. Large columns have been constructed that will handle about 5 g. of fatty acids in a single run.

4.10

end product in good yield. However, in the case of unconjugated fatty acids, some other mode of polymerization, such as the hydrogen-separation reaction, may be involved because in the study of the dimer of methyl linoleate, only a small amount of the end product expected from 1:4 addition theory was actually found.

Knowledge of molecular weight distributions in "stand" oils is relatively incomplete. There are two ways by which the molecular weight distribution problem may be studied. The "classical" method depends upon the fractionation of the polymeric mixture into fractions of different polymer size. This method is unsatisfactory because it is impossible to isolate every species of molecule occurring in a polymeric mixture.

The second method for attacking molecular-weight distribution is by means of probability statistics following the Flory-Stockmayer approach. In tests of the method, preliminary experiments have indicated that fair agreement exists between the calculated and observed weight average molecular weights as determined by light scattering.

6.135 WATER CONE CLEANS AIR OR GAS EFFLUENT Anonymous Chemical Engineering 62, No. 2, 240, 242 (February 1955) A new gas-liquid contactor or turbine scrubber is now available for removing air-borne particles from the smoke or dust of manufacturing concerns. This scrubber removes finely divided particles by wetting them. Water soluble pollutants can be recovered by precipitation from, or evaporation of, the scrubbing medium, or they can be recovered in a chemical solution or in an oil. The scrubber may also be of value where intimate contact between gas and liquid is desired, as in a processing operation. The turbine scrubber has a kettlelike base that contains a bottom-driven turbine impeller (see figure, over). A diffuser cone with tangential venturi-shaped perforations surrounds the turbine impeller. This impeller and the cone, which supports it, are mounted within a cylindrical diffusion chamber, with the opening of the cone pointed upward in the direction of the chamber vent. The scrubber is available in either single units for handling less than 10,000 cubic feet of air per minute or in multi-stage units for handling larger volumes of air. In the operation of the scrubber, water or some other scrubbing medium is introduced into the base of the kettle until the impeller is completely covered. Contaminated air or gas is then directed into the diffusion chamber, and the impeller is started. Movement of the impeller forces the scrubbing medium to form a vortex along the sides and up and across the venturi openings in the cone-shaped portion of the diffusion chamber. Because of the pressure differential, the gas stream flows tangentially through the venturi openings into the spinning vortex. The entrained particles become wet (over) COMMERCIAL FISHERIES ABSTRACTS VOL VIII NO. 4 PAGE 15 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE. ABSTRACTER: Martin Heerd	6.54 HYDROLYZED FISH PROTEIN FROM THE FLESH OF WASTE FISH Mohanly, G. B. and Roy, A. B. (Department of Fisheries, Orissa, India) Science 121, No. 3132, 41-42 (January 7, 1955) In many parts of India, the flesh of sharks and rays is not considered palatable. However, sharks, rays, and other waste fish are excellent sources of protein even if no attempt has been made to utilize these species for food. The authors used the flesh of sharks and rays to prepare a hydrolyzed fish protein. The flesh was minced, washed, and cooked for 1/2 to 1 hour in dilute acetic acid solution at 80° C. until the muscle became threadlike when pressed. The cooked flesh was then thoroughly washed to remove acids and lipids (until the overflow water ran clear), pressed to remove water, dried, and extracted several times with petroleum ether to remove fat. The resulting fat-free protein is insoluble in water and is non-diffusible. To make this protein easy to absorb, hydrolyzation is necessary. Because acid hydrolysis might destroy some of the amino acid end-products, the authors hydrolyzed the fat-free protein with 10 to 12 percent sodium hydroxide at 80° C. This protein, when completely hydrolyzed (liquid), was neutralized with 85-percent acetic acid and was then spray dried. A 10-percent yield of a cream colored, flourlike powder containing 85-percent protein was obtained. Table 1 compares the amino acid composition of this powder with that of beef, casein, and egg albumin. Hydrolyzed fish-protein powder is soluble in water, keeps well, and whips better than does egg albumin. It can be used in the plastics, paint, leather, and rayon-fiber industries, but it is most useful as a food for hospitalized patients as well as for those suffering from malnutrition or from duodenal and ventricular ulcers. (over) COMMERCIAL FISHERIES ABSTRACTS VOL VIII NO. 4 PAGE 15 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE. ABSTRACTER: Martin Heerd
6.193 MULTIPLICITY OF UNIDENTIFIED GROWTH FACTORS REQUIRED BY CHICKS AND POULTS Combs, G. F.; Sweet, G. B.; Jones, H. L.; Romoser, G. L.; and Bishop, R. W. (University of Maryland, College Park) Poultry Science 33, No. 5, 1050 (September 1954) Studies with New Hampshire or NH x BPR crossbred chicks and BBB x BW crossbred poult, involving purified type rations containing isolated soybean protein, sucrose and adequate amounts of all known required nutrients, indicate that at least three different unidentified nutrients are required for rapid growth. The results also indicate that one of these, the "liver factor," is supplied by condensed fish solubles, liver fraction NF-2 (Armour and Co.), and a grain fermentation solubles product. Another, the "whey factor," is present in dried whey products, dried molasses distillers solubles, dried brewers' yeast and certain fermentation products. The third, the "alfalfa factor" is found in dehydrated alfalfa meal and dried brewers' yeast. However, most of the crude products tested appear to contain measurable quantities of more than one of these factors. The multiple occurrence of these factors in various ingredients has made it difficult to develop chick growth assays which are suitable for measuring the response to only one of these unidentified growth factors. Reprinted in whole COMMERCIAL FISHERIES ABSTRACTS VOL VIII NO. 4 PAGE 15 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE.	6.193 THE EFFECT OF TERRAMYCIN ON FISH SOLUBLES, OR BOTH, ON THE GROWTH, ADRENAL GLANDS AND GONADS OF THE RAT Dickson, William M.; Patterson, Eugene B.; Stern, Joel R.; and McGinnis, J. (Washington State College, Pullman, Washington) Journal of Nutrition 54, No. 4, 631-641 (December 10, 1954) The authors explored the action and the effect of terramycin hydrochloride and fish solubles on endocrine glands. Weanling rats, 21 days old, were used as test animals. Since an increase in weight could result from the deposition of fat or water retention, tail growth was selected as a means of measuring skeletal growth when studying the action of growth factors. Rats on a practical-type basal ration supplemented with fish solubles showed a significant (P < 0.05) growth response at 21 days after weaning. Rats on a semi-purified basal diet supplemented with fish solubles showed a significant growth response at 21 and 49 days but not at 77 days post weaning. This growth response was measured by weight gains and by the increase in tail length. Terramycin as a supplement to the basal ration failed to stimulate the growth of normal healthy rats to a significant degree. However, if surgery (castration or sham-castration) was performed 14 to 20 days after weaning, significant (P < 0.05) growth stimulation was obtained after 49 days on the basal ration supplemented with terramycin. It appears, therefore, that terramycin was a growth stimulant only if the rats were subjected to stress. Both terramycin and fish solubles as supplements to the basal ration appeared to cause an increase in the weight of the adrenal gland in the growing rat. Neither terramycin nor fish solubles as a supplement to the basal ration had any effect on the weight of the sex organs of growing male rats. (over) COMMERCIAL FISHERIES ABSTRACTS VOL VIII NO. 4 PAGE 15 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE. ABSTRACTER: Martin Heerd

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The weight of the ovaries and uterus of growing female rats on a semi-purified basal ration supplemented with fish solubles increased significantly at 49 days post weaning. The weight of the uterus of intact female rats, but not castrate female rats, increased significantly ($P < 0. 1$) on the basal ration supplemented with fish solubles.

6. 54

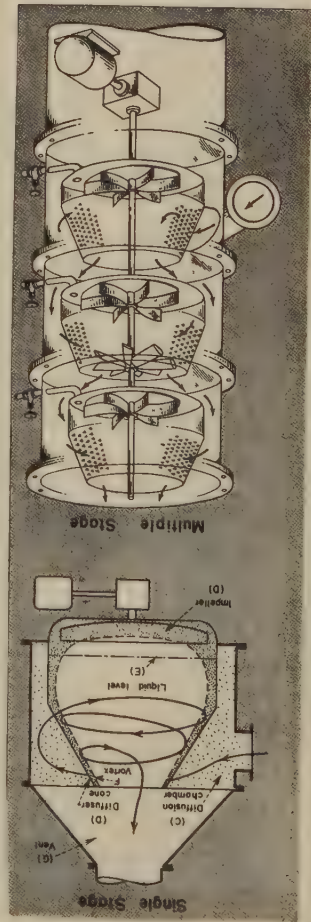
Table 1. Approximate percentage composition of selected animal proteins.

Amino acids	Beef muscle	Casain	Egg albumen	Protein from waste fish flesh
Cystine	1.1	0.35	1.9	0.49
Lysine	8.3	7.6	6.0	1
Leucine	8.3	8.3	5.9	2.5
Arginine	2.1	2.1	1.7	2.5
Serine, glycine, aspartic acid	7.2	4.3	5.9	7.3
Threonine, glutamic acid	16.7	14.3	18.7	12.9
Alanine	30.6	27.1	21.5	15
Valine	5.6	5.5	7.2	1.5
Tyrosine	8.7	8.7	8.7	8.0
Methionine, valine	8.12	9.9	11.9	8.0
Leucine, isoleucine	13.1	16	17.1	5.3

6. 135 (Cross Reference: 0. 12)

in this vortex and move into the scrubbing medium, whereas the gas passes through the rotating curtain and is discharged through the vent. Successful operation of the scrubber depends upon the speed of the impeller, the shape and design of the venturi openings in the cone, and the balance established between the incoming air and the centrifugal effect of the rotating vortex.

Air or gas to be scrubbed is fed into the unit under pressure by a blower. Only 40 gallons of scrubbing medium is required for a unit that will handle 2500 cubic feet of air per minute. This size of unit requires 2.4 brake horsepower to drive the impeller and 3 horsepower to drive the blower. Liquid loss is due mainly to evaporation. If the air or gas is heavily loaded with particulate material, the scrubbing medium must be bled off continually for clarification or for replacement with fresh medium. Multi-stage units can be operated with a different scrubbing medium in each stage.



7. 89 SIMPLIFIED TEST ON THE FRESHNESS OF FISH MEAT. III. NONPRECIPITABILITY OF HEXONE BASE WITH MERCURIC CHLORIDE Amano, K.; Uchiyama, H.; and Tomiya, F. Bull. Japan. Soc. Sci. Fisheries 15, 262-6 (1949) Chemical Abstracts 48, No. 17, 10250 (1954) The coagulation test of sol. proteinlike substances with $HgCl_2$ soln. was reported as a delicate method for detecting early stages of decomposition of fish flesh. The coagulum probably contains sol. protein and also mercuric amino chloride but in lesser amt. To solve the problem of the presence of hexone bases, the precipitability of $HgCl_2$ with hexone bases was examined in aq. exts. of fish muscle. No ppts. were formed with CCl_3COOH-treated exts. of putrid flesh of the skipjack. In the 2nd expt. the amt. of hexone bases was std. in the filtrates obtained either by removing the ppts. of CCl_3COOH or of $HgCl_2$ in the aq. exts. of fish flesh. Filtrates of marlin flesh, stored at room temp., were treated with sulfuric and phosphotungstic acids in order to ppt. hexone bases. The N content of the ppts. was detd. by the Kjeldahl method. The amt. of hexone base N is not much different in the filtrates of 2 kinds as far as the primary cleavage of the muscle protein goes. In the light of these expts., it can be assumed that $HgCl_2$ does not react with the hexone bases in the aq. exts. of fish meat. Further, H_2O-soln. protein is the major constituent in the coagulum. Cu salts, such as the sulfate and chloride, though not so delicate, can be used instead of $HgCl_2$ for detecting early decomposition. COMMERCIAL FISHERIES ABSTRACTS VOL VIII NO. 4 PAGE 17 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE Reprinted in whole	7. 871 THE USE OF THIOBARBITURIC ACID AS A MEASURE OF FAT OXIDATION Sidwell, C. G.; Salwin, H.; Bence, Milada; and Mitchell Jr., J. H. (Quartermaster Food and Container Institute for the Armed Forces, Chicago) Journal of the American Oil Chemists' Society 31, No. 12, 803-806 (December 1954) Objective tests for food-product deterioration are desirable to facilitate research investigations on stability and to aid in specifying product quality. Recently, 2-thioarbituric acid (TBA) has been proposed as a reagent having potentialities of partially fulfilling these requirements. In the oxidation of fats, compounds are formed that can be reacted with TBA to give red-colored products. Patton and Kurtz studied the reaction of TBA with milk fat, and Dunkley and Jennings published a procedure for oxidized fluid milk. Briggs and Bryant modified the method for milk and extended its applications to milk powder, cheese, and butter. In the work of the authors, an evaluation of TBA as an agent for the measurement of fat oxidation was made by the application of several empirical procedures to animal and vegetable fats. An extraction procedure was used for removing the products of oxidation. The reaction with TBA was conducted with the aid of a boiling-water bath to produce a red color, which was then estimated spectrophotometrically. Fats stored at -20°, 0°, 72°, and $100^\circ F.$ and oxidized by the active oxygen method (AOM) and by ultraviolet irradiation were examined. (over) COMMERCIAL FISHERIES ABSTRACTS VOL VIII NO. 4 PAGE 17 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: F. Bruce Sanford
7. 44 SUMMARY OF THE COLLABORATIVE WORK ON TOTAL NITROGEN Bates, R. W.; Etheredge, M. P.; and Quackenbush, F. W. Journal of the American Oil Chemists' Society XXXII, No. 1, 35-38 (January 1955) The objective of the work was to provide a basis for elimination of numerous variations in the procedure for total nitrogen in fertilizers and feeds. Specifically, the work (1) compared copper with mercury as a catalyst, (2) compared boric acid with standard acid for absorption of ammonia, and (3) compared the various heating devices used in the digestion of the sample. Twenty-seven laboratories took part in the work; 12 had expressed a preference for copper as the catalyst (Group 1); 11 others had expressed a preference for mercury (Group 2); and the remainder had expressed no preference. The directions to the collaborators were precise. Samples were to be run in duplicate with each catalyst, and the analysis was to be repeated at least one week later. Standard acid and standard alkali were to be prepared independently, then checked one against the other. Boric acid was to be compared with standard acid on two samples. Detailed digestion procedures were given. The results were as follows: (1) Mercury gave 0.05 percent more N than did copper, in the hands of Group 1, and 0.07 percent more, in the hands of Group 2. The difference was highly significant for both groups. (2) The results with mercury were less variable than those with copper, in the hands of both groups. Averaged over the 10 samples, the standard deviation of the 27 laboratories was 0.186 percent N with mercury, and 0.238 percent N with copper. (3) Averaged over both catalysts and all samples, Group 2 obtained 0.02 percent more N than did Group 1. This difference is significant. (4) Standard acid gave 0.05 percent more N than did boric acid, when averaged over 2 samples, (over) COMMERCIAL FISHERIES ABSTRACTS VOL VIII NO. 4 PAGE 17 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: William Clegg	7. 80 SELECTION OF A FOOD TASTING PANEL: DISCERNMENT OF PRIMARY TASTES IN WATER SOLUTION COMPARED WITH JUDGING ABILITY FOR FOODS Mackey, Andrea Overman and Jones, Patsy (Dept. of Home Economics of the Oregon Experimental Station, Oregon State College, Corvallis) Food Technology 5, No. 11, 527-530 (November 1954) If a relationship could be established between the sensitivity of a taster to primary taste substances and the ability of the taster to detect different levels of these same substances in food, this ability could be used as a basis for selecting taste-panel members. Only two studies have been made in which this relationship has been investigated. In one, the food used was bread baked with different levels of sodium chloride, sucrose, lactic acid, and caffeine. No correlation was found between the group's consistency in judging solutions and its ability to rate correctly the samples of bread containing the various quantities of the test substances. In another investigation planned to evaluate preference in terms of saltiness of bacon, a low but significant correlation was found between the judges' ratings and the actual salt content of the bacon. An exploration was made of the possibility that sensitivity to primary taste substances (salt, sugar, tartaric acid, caffeine) in water solution might be related to the tasters' ability to detect different levels of these same substances in food. Twenty-two individuals were tested to determine their thresholds for primary taste substances in water solution and their ability to arrange a series of such solutions in the correct order of concentration. They were also tested to determine their ability to arrange, in order, foods containing different levels of these same taste constituents. (over) COMMERCIAL FISHERIES ABSTRACTS VOL VIII NO. 4 PAGE 17 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Kathryn L. Osterhaug

both catalysts, and all laboratories. The difference was highly significant. For Group 1, the difference was 0.03 percent; for Group 2, 0.08 percent. (5) On the burner-heating test (time required to heat 250 ml. water to a rolling boil), gas was more variable than was electricity. Laboratory averages ranged from 4 1/2 to 16 1/2 minutes.

The results show the superiority of mercury over copper as a catalyst for the digestion of samples in the determination of total nitrogen. There would seem to be no important reason for retaining copper as an alternate reagent in official procedures. Although boric acid has been gaining favor over standard acid for absorption of ammonia, the collaborative results fail to support its use.

The wide range of results from the boil-test raises a question concerning optimal digestion time. The total digestion time reported varied from 55 minutes to more than 3 hours. Although the statistical study relating digestion time, burner temperature, and total nitrogen found is not complete, no close relation is apparent except with the slowest heating equipment.

The authors recommend the following: (1) The use of copper as a catalyst in official methods for total nitrogen should be discontinued. (2) The directions for preparing standard acid and standard alkali should be deleted. The new directions should refer to Chapter 39 and require the use of a primary standard for each solution, and each solution should be checked one against the other. (3) The collaborative mercury procedure, changed to omit reference to boric acid, should be adopted, first action.

Tasters were able to arrange (a) water solutions and (b) foods in proper order with high accuracy, but the ability of the individual tasters was not highly correlated in these two tests. Also, high sensitivity, as indicated by low threshold value, did not correlate significantly with ability to arrange, in order, foods containing varying concentrations of taste substances.

TABLE 5
Threshold values for sweet taste in water solutions as related
to taste correlation coefficients for arrangement of identified
mixtures varied 10 to 100 percent

Judge	Threshold value as indicated by no. of soln. of 115 (ave. of 3 rep.)	Water soln. value	Applesauce	Mayonnaise	Pumpkin
A	5.0	.97	.98	.99	.99
B	5.0	.97	.97	.98	.98
C	5.0	.97	.97	.98	.98
D	5.0	.97	.97	.98	.98
E	5.0	.97	.97	.98	.98
F	5.0	.97	.97	.98	.98
G	5.0	.97	.97	.98	.98
H	5.0	.97	.97	.98	.98
I	5.0	.97	.97	.98	.98
J	5.0	.97	.97	.98	.98
K	5.0	.97	.97	.98	.98
L	5.0	.97	.97	.98	.98
M	5.0	.97	.97	.98	.98
N	5.0	.97	.97	.98	.98
O	5.0	.97	.97	.98	.98
P	5.0	.97	.97	.98	.98
Q	5.0	.97	.97	.98	.98
R	5.0	.97	.97	.98	.98
S	5.0	.97	.97	.98	.98
T	5.0	.97	.97	.98	.98
U	5.0	.97	.97	.98	.98
V	5.0	.97	.97	.98	.98
W	5.0	.97	.97	.98	.98
X	5.0	.97	.97	.98	.98
Y	5.0	.97	.97	.98	.98
Z	5.0	.97	.97	.98	.98
AA	5.0	.97	.97	.98	.98
AB	5.0	.97	.97	.98	.98
AC	5.0	.97	.97	.98	.98
AD	5.0	.97	.97	.98	.98
AE	5.0	.97	.97	.98	.98
AF	5.0	.97	.97	.98	.98
AG	5.0	.97	.97	.98	.98
AH	5.0	.97	.97	.98	.98
AI	5.0	.97	.97	.98	.98
AJ	5.0	.97	.97	.98	.98
AK	5.0	.97	.97	.98	.98
AL	5.0	.97	.97	.98	.98
AM	5.0	.97	.97	.98	.98
AN	5.0	.97	.97	.98	.98
AO	5.0	.97	.97	.98	.98
AP	5.0	.97	.97	.98	.98
AQ	5.0	.97	.97	.98	.98
AR	5.0	.97	.97	.98	.98
AS	5.0	.97	.97	.98	.98
AT	5.0	.97	.97	.98	.98
AU	5.0	.97	.97	.98	.98
AV	5.0	.97	.97	.98	.98
AW	5.0	.97	.97	.98	.98
AX	5.0	.97	.97	.98	.98
AY	5.0	.97	.97	.98	.98
AZ	5.0	.97	.97	.98	.98
BA	5.0	.97	.97	.98	.98
BB	5.0	.97	.97	.98	.98
BC	5.0	.97	.97	.98	.98
BD	5.0	.97	.97	.98	.98
BE	5.0	.97	.97	.98	.98
BF	5.0	.97	.97	.98	.98
BG	5.0	.97	.97	.98	.98
BH	5.0	.97	.97	.98	.98
BI	5.0	.97	.97	.98	.98
BJ	5.0	.97	.97	.98	.98
BK	5.0	.97	.97	.98	.98
BL	5.0	.97	.97	.98	.98
BM	5.0	.97	.97	.98	.98
BN	5.0	.97	.97	.98	.98
BO	5.0	.97	.97	.98	.98
BP	5.0	.97	.97	.98	.98
BQ	5.0	.97	.97	.98	.98
BR	5.0	.97	.97	.98	.98
BS	5.0	.97	.97	.98	.98
BT	5.0	.97	.97	.98	.98
BU	5.0	.97	.97	.98	.98
BV	5.0	.97	.97	.98	.98
BW	5.0	.97	.97	.98	.98
BX	5.0	.97	.97	.98	.98
BY	5.0	.97	.97	.98	.98
BZ	5.0	.97	.97	.98	.98
CA	5.0	.97	.97	.98	.98
CB	5.0	.97	.97	.98	.98
CC	5.0	.97	.97	.98	.98
CD	5.0	.97	.97	.98	.98
CE	5.0	.97	.97	.98	.98
CF	5.0	.97	.97	.98	.98
CG	5.0	.97	.97	.98	.98
CH	5.0	.97	.97	.98	.98
CI	5.0	.97	.97	.98	.98
CJ	5.0	.97	.97	.98	.98
CK	5.0	.97	.97	.98	.98
CL	5.0	.97	.97	.98	.98
CM	5.0	.97	.97	.98	.98
CN	5.0	.97	.97	.98	.98
CO	5.0	.97	.97	.98	.98
CP	5.0	.97	.97	.98	.98
CQ	5.0	.97	.97	.98	.98
CR	5.0	.97	.97	.98	.98
CS	5.0	.97	.97	.98	.98
CT	5.0	.97	.97	.98	.98
CU	5.0	.97	.97	.98	.98
CV	5.0	.97	.97	.98	.98
CW	5.0	.97	.97	.98	.98
CX	5.0	.97	.97	.98	.98
CY	5.0	.97	.97	.98	.98
CZ	5.0	.97	.97	.98	.98
DA	5.0	.97	.97	.98	.98
DB	5.0	.97	.97	.98	.98
DC	5.0	.97	.97	.98	.98
DD	5.0	.97	.97	.98	.98
DE	5.0	.97	.97	.98	.98
DF	5.0	.97	.97	.98	.98
DG	5.0	.97	.97	.98	.98
DH	5.0	.97	.97	.98	.98
DI	5.0	.97	.97	.98	.98
DJ	5.0	.97	.97	.98	.98
DK	5.0	.97	.97	.98	.98
DL	5.0	.97	.97	.98	.98
DM	5.0	.97	.97	.98	.98
DN	5.0	.97	.97	.98	.98
DO	5.0	.97	.97	.98	.98
DP	5.0	.97	.97	.98	.98
DQ	5.0	.97	.97	.98	.98
DR	5.0	.97	.97	.98	.98
DS	5.0	.97	.97	.98	.98
DT	5.0	.97	.97	.98	.98
DU	5.0	.97	.97	.98	.98
DV	5.0	.97	.97	.98	.98
DW	5.0	.97	.97	.98	.98
DX	5.0	.97	.97	.98	.98
DY	5.0	.97	.97	.98	.98
DZ	5.0	.97	.97	.98	.98
EA	5.0	.97	.97	.98	.98
EB	5.0	.97	.97	.98	.98
EC	5.0	.97	.97	.98	.98
ED	5.0	.97	.97	.98	.98
EE	5.0	.97	.97	.98	.98
EF	5.0	.97	.97	.98	.98
EG	5.0	.97	.97	.98	.98
EH	5.0	.97	.97	.98	.98
EI	5.0	.97	.97	.98	.98
EJ	5.0	.97	.97	.98	.98
EK	5.0	.97	.97	.98	.98
EL	5.0	.97	.97	.98	.98
EM	5.0	.97	.97	.98	.98
EN	5.0	.97	.97	.98	.98
EO	5.0	.97	.97	.98	.98
EP	5.0	.97	.97	.98	.98
EQ	5.0	.97	.97	.98	.98
ER	5.0	.97	.97	.98	.98
ES	5.0	.97	.97	.98	.98
ET	5.0	.97	.97	.98	.98
EU	5.0	.97	.97	.98	.98
EV	5.0	.97	.97	.98	.98
EW	5.0	.97	.97	.98	.98
EX	5.0	.97	.97	.98	.98
EY	5.0	.97	.97	.98	.98
EZ	5.0	.97	.97	.98	.98
FA	5.0	.97	.97	.98	.98
FB	5.0	.97	.97	.98	.98
FC	5.0	.97	.97	.98	.98
FD	5.0	.97	.97	.98	.98
FE	5.0	.97	.97	.98	.98
FF	5.0	.97	.97	.98	.98
FG	5.0	.97	.97	.98	.98
FH	5.0	.97	.97	.98	.98
FI	5.0	.97	.97	.98	.98
FJ	5.0	.97	.97	.98	.98
FK	5.0	.97	.97	.98	.98
FL	5.0	.97	.97	.98	.98
FM	5.0	.97	.97	.98	.98
FN	5.0	.97	.97	.98	.98
FO	5.0	.97	.97	.98	.98
FP	5.0	.97	.97	.98	.98
FQ	5.0	.97	.97	.98	.98
FR	5.0	.97	.97	.98	.98
FS	5.0	.97	.97	.98	.98
FT	5.0	.97	.97	.98	.98
FU	5.0	.97	.97	.98	.98
FV	5.0	.97	.97	.98	.98
FW	5.0	.97	.97	.98	.98
FX	5.0	.97	.97	.98	.98
FY	5.0	.97	.97	.98	.98
FZ	5.0	.97	.97	.98	.98
GA	5.0	.97	.97	.98	.98
GB	5.0	.97	.97	.98	.98
GC	5.0	.97	.97	.98	.98
GD	5.0	.97	.97	.98	.98
GE	5.0	.97	.97	.98	.98
GF	5.0	.97	.97	.98	.98
GG	5.0	.97	.97	.98	.98
GH	5.0	.97	.97	.98	.98
GI	5.0	.97	.97	.98	.98
GJ	5.0	.97	.97	.98	.98
GK	5.0	.97	.97	.98	.98
GL	5.0	.97	.97	.98	.98
GM	5.0	.97	.97	.98	.98
GN	5.0	.97	.97	.98	.98
GO	5.0	.97	.97	.98	.98
GP	5.0	.97	.97	.98	.98
GQ	5.0	.97	.97	.98	.98
GR	5.0	.97	.97	.98	.98
GS	5.0	.97	.97	.98	.98
GT	5.0	.97	.97	.98	.98
GU	5.0	.97	.97	.98	.98
GV	5.0	.97	.97	.98	.98
GW	5.0	.97	.97	.98	.98
GX	5.0	.97	.97	.98	.98
GY	5.0	.97	.97	.98	.98
GZ	5.0	.97	.97	.98	.98
HA	5.0	.97	.97	.98	.98
HB	5.0	.97	.97	.98	.98
HC	5.0	.97	.97	.98	.98
HD	5.0	.97	.97	.98	.98
HE	5.0	.97	.97	.98	.98
HF	5.0	.97	.97	.98	.98
HG	5.0	.97	.97	.98	.98
HH	5.0	.97	.97	.98	.98
HI	5.0	.97	.97	.98	.98
HJ	5.0	.97	.97	.98	.98
HK	5.0	.97	.97	.98	.98
HL	5.0	.97	.97	.98	.98
HM	5.0	.97	.97	.98	.98
HN	5.0	.97	.97	.98	.98
HO	5.0	.97	.97	.98	.98
HP	5.0	.97	.97	.98	.98
HQ	5.0	.97	.97	.98	.98
HR	5.0	.97	.97	.98	.98
HS	5.0	.97	.97	.98	.98
HT	5.0	.97	.97	.98	.98
HU	5.0	.97	.97	.98	.98
HV	5.0	.97	.97	.98	.98
HW	5.0	.97	.97	.98	.98
HX	5.0	.97	.97	.98	.98
HY	5.0	.97	.97	.98	.98
HZ	5.0	.97	.97	.98	.98
IA	5.0	.97	.97	.98	.98
IB	5.0	.97	.97	.98	.98
IC	5.0	.97	.97	.98	.98
ID	5.0	.97	.97	.98	.98
IE	5.0	.97	.97	.98	.98
IF	5.0	.97	.97	.98	.98
IG	5.0	.97	.97	.98	.98</

6. 130 METHODS FOR IMPROVING FISH BYPRODUCTS Sola, Einar (Fishery Director's Chemical-Technological Research Institute, Bergen) Reports on Technological Research Concerning Norwegian Fish Industry III, No. 1 (1954) 48 pages This is a survey of fish-meal production methods in Norway. These methods are classified into groups according to (1) the use of lean fish and (2) the use of both lean and fat fish. The first group of methods are (1) the old method, which involves cooking, pressing, and the loss of the press liquid; (2) the Vega method for the production of whole meal; and (3) the Schlotter-hose method for the production of whole meal. The second group of methods are (1) the old method, (2) the Notevorp method (3) the Lysoysund method, (4) the evaporation method, (5) the Flesland method, (6) the Nygards method, (7) the extraction method, and (8) the wet-extraction method. Drying in rotary direct-fire-gas-heated drum dryers is discussed in detail, since (1) this is the most commonly used method of drying meal in Norway and (2) this type of dryer is often operated incorrectly. Directions for correct operation are given. The production costs for making a meal by the Flesland method and by the wet-extraction method are compared. Seventeen figures are presented, including the schematic drawing of extraction apparatus shown on the back of this card. (over) COMMERCIAL FISHERIES ABSTRACTS VOL VIII NO. 4 PAGE 19 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Martin Heerdt	6. 3 PHYSICAL STUDIES ON CARREGENIN AND CARRAGEENIN FRACTIONS Smith, David B., Cook, W. H., and Neal, J. L. (National Research Laboratories, Ottawa) Archives of Biochemistry and Biophysics 53, No. 1, 192-203 (November 1954) Carrageenin has been shown to contain two, and possibly more, polysaccharides. Two fractions have been separated from carrageenin on the basis of differing response to potassium ion. One fraction, K-carrageenin, is precipitated by added potassium chloride, while the other, λ-carrageenin, remains in solution. These fractions differ in sulfate content, optical rotation, and other properties. Sedimentation and viscosity measurements indicate that the molecular weight of λ-carrageenin is higher than that of K-carrageenin, and it probably has the greater molecular extension. These fractions are responsible for the appearance of two components in ultracentrifugal analysis of carrageenin preparations of high intrinsic viscosity. COMMERCIAL FISHERIES ABSTRACTS VOL VIII NO. 4 PAGE 19 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: F. Bruce Sanford
6. 130 HOW TO MAKE UP CONTROL CHARTS FOR AUTOMATIC SCALES Rudd, John K. (Richardson Scale Company) Feedstuffs 27, No. 1, 10-11, 43 (January 1, 1955) Before it is possible to make control charts for automatic scales, basic information about statistical control, probability, frequency distribution, and standard deviation is needed. Control is obtained by collecting quantitative data, analyzing it, and applying statistical techniques. Automatic weighing is concerned with two phases of statistical control: (1) the accuracy of a particular scale and (2) the accuracy that is within the requirements of the process. The accuracy of any scale is largely influenced by the characteristics of the material being weighed and by the size and uniformity of the stream admitted to the weigh hopper. The laws of probability have an effect on any operation. In demonstrating the workings of these laws, the author tossed 10 pennies 400 times. He found that 5 pennies fell heads up 103 times. There were progressively fewer instances of 4 or 6 heads, 3 or 7 heads, 2 or 8 heads, and 1 or 9 heads. There were no instances of 0 or 10 heads. Plotting the frequency of occurrence against the number of heads observed gave a nearly symmetrical graph. This plot is called a frequency-distribution curve. It is typical of the variations caused by chance alone. Probability theory states that in tossing 10 coins 400 times, the experimenter could expect to get 5 heads more often than any other number of heads. Actually, the average obtained in the experiment was 5.03. Probability theory can also tell him how many times he could theoretically expect to get any number of heads in some other coin-tossing experiment, and this theoretical number, if plotted, produces a probability curve of normal distribution. (over) COMMERCIAL FISHERIES ABSTRACTS VOL VIII NO. 4 PAGE 19 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: Martin Heerdt	6. 3 SEAWEEDS AS A FOOD Ash, A. S. F. (Division of Food Preservation and Transport, Homebush, N.S.W.) Food Preservation Quarterly 14, No. 4, 71-73 (December 1954) Seaweeds are commonly classified by color: brown, red, green, and blue-green. Only the brown and red seaweeds are economic possibilities as food. <u>Carbohydrates.</u> -- Seaweeds are predominately carbohydrate in composition. In brown algae, the carbohydrates are chiefly mannitol, laminarin, and the cell-wall substances alginic acid, cellulose, and fucoidin. There are virtually no free reducing sugars. D-mannitol is considered to be the primary product of photosynthesis. It has half the sweetness of cane sugar but can be utilized in the body only to a limited extent. It is used on some edible products as a dusting powder. Laminarin, the reserve carbohydrate analogous to starch, is composed of chains of about 20 D-glucopyranose units. A potential source of glucose, laminarin is well utilized by farm animals. Although common cellulose occurs in the cell wall, the chief structural substance in brown algae is alginic acid. The nutritive value of alginic acid appears doubtful. However, alginates are useful as emulsifying agents to improve texture in foodstuffs. The cell wall-constituent fucoidin probably has no food value. In the red algae, the carbohydrates, with the exception of agar, have been less studied. Agar is found in algae of the subclass Florideae and is a gelatinous cell-wall substance consisting of 1 to 3 D-galactopyranose units esterified with sulfuric acid. Agar probably has no nutritive value, but it is an excellent laxative. Certain red seaweeds contain carrageenin, which can be used as a substitute for agar, being similar in composition. (over) COMMERCIAL FISHERIES ABSTRACTS VOL VIII NO. 4 PAGE 19 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: F. Bruce Sanford

2.00	ON THE BIOCHEMICAL CHANGES OF FISH MUSCLE AFTER DEATH Yoshimura, Katsuju; Kubo, Shuichiro; and Ito, Yasuzo Bulletin of the Faculty of Fisheries, Hokkaido University <u>4</u> , No. 2, 157 (August 1953) (English summary, tables and figures) Protein in muscle decreased rapidly for a few hours and thereafter slowly. Ammonia, end product of nitrogen compound, increased rapidly in the first period and slowly in the latter period. Glycogen disappeared and lactic acid increased in a few hours after death.	2.01	STUDIES ON COLI-GROUP DISTRIBUTED IN MARINE FOODS. I. COLI-SCORE IN SQUID (<i>OMMASTREPHES SLOANI PACIFICUS</i>) CAUGHT IN THE SEA NEAR HAKODATE Tanikawa, Eiichi; Kunisawa, Kazuo; and Abe, Shinji Bulletin of the Faculty of Fisheries, Hokkaido University <u>4</u> , No. 2, 185 (August 1953) (English summary, tables and figures) After landing, the number of the organisms of coli-group on the surface was larger than in viscera.
2.00	POST-MORTEM CHANGES IN FISH Riemann, H. Danske Dyrleageforen. Medlemsbl. No. 11, 173 and No. 12, 189 (1952) Food Science Abstracts <u>26</u> , No. 3, 255 (May 1954) An account of the biochemical and bacteriological changes which take place during the spoilage of marine fish based mainly on the published literature.	2.01	STUDIES OF FISH SPOILAGE. III. THE TRIMETHYLAMINE OXIDE CONTENT OF THE MUSCLES OF NOVA SCOTIA FISH Beatty, S. A. Journal of the Fisheries Research Board of Canada <u>IV</u> , No. 4, 229-232 (March 1939) (Abstract of this article appears under 8.59 page 9 - March 1955 issue)
2.00	THE AUTOLYTICAL AND BACTERIAL DECOMPOSITION OF THE PROTEIN IN FRESH AND SALTED COD Winter, Herbert Deut. Lebensm. Rundschau <u>46</u> , 210-13 (1950) Chemical Abstracts <u>45</u> , No. 1, 280 (1951)	2.01	STUDIES ON BACTERIAL CONTAMINATION AND DISINFECTION IN CANNERIES Tanikawa, Eiichi and Kiya, Tadahiko Bulletin of the Faculty of Fisheries, Hokkaido University <u>5</u> , No. 3, 299-308 (November 1954) I. Bacterial contamination in canneries II. Disinfective effect of sodium hypochlorite in canneries
2.01	DEGRADATION OF TRIMETHYLAMINE OXIDE AND THE AMMONIA ODOR IN FROZEN SHARK MEAT Bruno, Giuseppe Riv. med. vet. <u>5</u> , 49-60 (1953) Chemical Abstracts <u>48</u> , No. 22, 14026 (1954)	2.111	NYLON NETS Mersereau, H. C. Canadian Fisherman <u>41</u> , No. 8, 35 (August 1954)
2.01	CHEMICAL STUDIES ON THE FRESHNESS OF WHALE MEAT. IV. ACHROMABACTER UBIQUITUM ISOLATED FROM WHALE CARCASS Nakai, Tadashi J. Pharm. Soc. Japan <u>71</u> , 152-6 (1951) Chemical Abstracts <u>45</u> , No. 14, 6314 (1951)	2.111	ANTISEPTIC COATING FOR FISHING NET Terauchi, Mitsuo Japan. patent 180, 349 (September 21, 1949) Chemical Abstracts <u>46</u> , No. 6, 2762 (1952)
2.01	BACTERIA CAUSING SPOILAGE OF FRESH FISH; THEIR ACTIVITY IN PRODUCING HISTAMINE Kimata, Masao and Tanaka, Mikio Mem. Research Inst. Food Sci., Kyoto Univ. No. 7, 12-17 (1954) Chemical Abstracts <u>48</u> , No. 12, 7219 (1954)	2.111	STUDIES ON ANTISEPSIS Fukuda, Hironari Bulletin of the Japanese Society of Scientific Fisheries <u>19</u> , No. 9, 929-41 (1954) (English summary and table) I. Antiseptic coating with protein sols II. Antiseptic treatment with polyvinyl latex as the binder The results of these treatments were not satisfactory.

4. 12	FORMATION OF PEROXIDES IN FATTY ESTERS. II. METHYL LINOLEATE: APPLICATION OF THE POLAROGRAPHIC AND DIRECT OXYGEN METHODS Riccieti, C.; Willis, C. O.; Ogg, C. L.; Morris, S. G.; and Riemenschneider, R. W. Journal of the American Oil Chemists' Society <u>31</u> , No. 11, 456 (November 1954)	4. 5	THE USE OF THIOBARBITURIC ACID AS A MEASURE OF FAT OXIDATION Sidwell, C. G.; Salwin, Harold; Benca, Milada; and Mitchell, J. H. Journal of the American Oil Chemists' Society <u>31</u> , No. 12, 603-606 (December 1954) (Abstract of this article appears under 7. 871 page 17)
4. 12	PHOTOCHEMICAL OXIDATION OF FATTY ACID ESTERS WITH AND WITHOUT CHLOROPHYLL, ULTRAVIOLET AND INFRARED STUDIES OF PRODUCTS Khan, N. A.; Tolberg, W. E.; Wheeler, D. H.; and Lundberg, W. O. Journal of the American Oil Chemists' Society <u>31</u> , No. 11, 461 (November 1954)	4. 5	CHEMICAL AND KINETIC STUDIES ON THE AUTOXIDATION OF FATTY ACID ESTERS Privett, O. S. Annual Report of the Hormel Institute, University of Minnesota (1953-54) (Abstract of this article appears under 4. 12 page 13)
4. 12	A METHOD OF CALCULATING FATTY ACID COMPOSITION FROM ESTER FRACTIONATION ANALYSIS Jones, E. W. and MacLean, M. A. Journal of the American Oil Chemists' Society <u>31</u> , No. 11, 473 (November 1954)	4. 5	USE OF THE 2-THIOBARBITURIC ACID REAGENT TO MEASURE RANCIDITY IN FROZEN PORK Turner, E. W.; Paynter, W. D.; Montie, E. J.; Bessert, M. W.; Struck, G. M.; and Olson, F. C. Food Technology <u>8</u> , No. 7, 326-330 (July 1954) (Abstract of this article appears under 7. 879 page 7 - November 1954 issue)
4. 12	THE INFLUENCE OF DIETARY FAT ON THE GLYCERIDE STRUCTURE OF ANIMAL FAT Reiser, Raymond and Dieckert, Julius W. Journal of the American Oil Chemists' Society <u>31</u> , No. 12, 625 (December 1954)	4. 64	RANCIDITY OF BUTTERFAT Mukherjee, S.; Ray, S.; and Goswami, M. J. Indian Chem. Soc. <u>27</u> , 539-47, 557-62 (1950) Chemical Abstracts <u>45</u> , No. 13, 5836 (1951) II. L-ascorbyl esters of fatty acids as antioxidants III. Use of ethyl gallate in combination with other antioxidants IV. Factors influencing rancidity
4. 29	PREPARATION OF ESTERS OF UNSATURATED FATTY ACIDS AND A STUDY OF THEIR FILM-FORMING PROPERTIES Chipault, J. R. Annual Report of the Hormel Institute, University of Minnesota, 15-17 (1953-54) The fatty acids recovered from films of trilinolein and trilinolenin at two different stages of drying have been analyzed for a number of functional groups. When the films became tacky about one-half of the unsaturation had disappeared and a good share of the remaining double bonds had been changed to a conjugated <u>trans</u> configuration.	4. 64	ANTIOXIDANT ACTIVITY AND ANTAGONISM TO MICROBIAL GROWTH BY PIPERINE, ISONICOTINYL HYDRAZIDE AND RELATED COMPOUNDS Hasselstrom, Torsten; Dateo, G. P.; Levinson, H. S.; Stahl, W. H.; Hewitt, E. J.; and Konigs-Bacher, K. S. Food Research <u>19</u> , No. 4, 373-376 (July-August 1954) (Abstract of this article appears under 3. 12 page 19 - December 1954 issue)
4. 29	ULTRASONIC WAVES AND CHEMICAL REACTION. IV. THE ALTERATION OF THE ACID VALUE OF FISH OIL BY SUPERSONIC WAVES Shiraishi, Takeshi J. Electrochem. Soc. Japan <u>17</u> , 45-46 (1949) Chemical Abstracts <u>48</u> , No. 13, 7918 (1954) The alteration of acid value of whale oil by supersonic waves was studied. At 500-kc. waves, bubbles developed and the acid value of whale oil is increased greatly. The elec. power range was 0-200 w. The pressure used was 1 atm., 40 mm. Hg, and 60 mm. Hg.	4. 64	DISSOLVING ANTIOXIDANT IN GLYCOL INCREASES ITS SOLUBILITY IN ANIMAL FATS Anonymous Chemical Processing <u>17</u> , No. 6, 51 (June 1954)
4. 29	POLYMERIZATION, COPOLYMERIZATION AND ISOMERIZATION Cowan, J. C. Journal of the American Oil Chemists' Society <u>31</u> , No. 11, 529 (November 1954)		

6.133	THE MODIFICATION OF [FISH] FAT DURING THE PROCESS OF ITS EXTRACTION Perepletshik, R. R. Rybnoe Khozyaistvo 24, No. 5, 38-41 (1948) Chemical Abstracts 46, No. 16, 7795 (1952)	6.193	PIG FEEDING TESTS Lakesvela, B. Meldinger fra SSF, No. 3, 53-63 (May 1954) (English summary) Eighteen 8- to 10-week-old pigs were divided into 3 groups of 6 pigs each. Group 1 received an all-vegetable basal ration; group 2, the basal ration supplemented with 3 percent whole herring meal; and group 3, the basal ration supplemented with 6 percent whole herring meal. All rations were equivalent in content of amino acids, minerals, and fat-soluble vitamins. Although groups 2 and 3 consumed, respectively, 2.7 and 6.5 percent less of their rations than did group 1, growth in groups 2 and 3 was greater than that in group 1. The reduction in feed consumption and the stimulated growth were probably due to unidentified growth factors. No off flavors were detectable in the bacon from any of the groups.
6.133	DEVELOPMENT OF FISH-OIL POLYMERIZATION Hugel, E. Fette u. Seifen 53, 264-6 (1951) Chemical Abstracts 45, No. 17, 7804 (1951)	6.193	ENVIRONMENT AND THE RESPONSE TO UNIDENTIFIED GROWTH FACTORS Couch, J. R. Feedstuffs 26, No. 51, 16 (December 18, 1954) Antibiotics do not increase the growth rate of chickens or turkeys reared under conditions which can be termed a "clean environment."
6.137	MECHANISM OF FISH-OIL EXTRACTION BY MEANS OF THE ULTRA-SHORT WAVES Yamada, Minoru and Ishida, Masami Science (Japan) 21, 467-8 (1951) Chemical Abstracts 45, No. 22, 10619 (1951)	6.55	FISH BY-PRODUCTS Lovern, J. A. Food Manufacture 29, No. 11, 436 (November 1954) (Abstract of this article appears under 6.134 page 15 - March 1955 issue)
6.137	SPERM-WHALE OIL. I. MOLECULAR DISTILLATION OF SPERM-BLUBBER OIL Fujii, Hasashi, Matsumoto, Hirokichi; Goto, Kenji; and Nagata, Mitsuo Repts. Research Lab. Nippon Suisan Co. 6, 24-29 (1954) Chemical Abstracts 48, No. 22, 14254 (1954)	6.55	FISH CONCENTRATE FOR ANIMAL FEED Beckwith, Gertrude H. and Sutherland, James L. U. S. patent 2,566,549 (September 4, 1951) Chemical Abstracts 45, No. 22, 10435 (1951)
6.137	FISH-OIL REFINING Pueschel, Oscar W. Italian patent 461,372 (January 25, 1951) Chemical Abstracts 46, No. 6, 2826 (1952)	6.55	PROTEIN-VITAMIN CONCENTRATES FROM THE WASTES FROM SEA MOLLUSKS Zikeev, B. V. Rybnoe Khoz. 24, No. 2, 27-8 (1948) Chemical Abstracts 45, No. 13, 5881 (1951)
6.137	MOLECULAR DISTILLATION OF SPERM-BLUBBER OIL Ishikawa, Seiichi; Omote, Yoshimori; and Kanno, Hideo J. Chem. Soc. Japan, Ind. Chem. Sect. 52, 21-2 (1949) Chemical Abstracts 45, No. 3, 1361 (1951)		
6.137	PROCESSING FATTY OILS Rich, A. D. Industrial and Engineering Chemistry 46, No. 11, 2272 (November 1954)		

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Analytical Chemistry	Frosted Food Field
Archives of Biochemistry and Biophysics	Industrial and Engineering Chemistry
Australian Journal of Marine and Freshwater Research	Industrial Refrigeration
Biochemical Journal	Journal of Agricultural and Food Chemistry
Bulletin of the Faculty of Fisheries, Hokkaido University	Journal of Applied Chemistry
Bulletin of the Japanese Society of Scientific Fisheries	Journal of Biological Chemistry
California Fish and Game	Journal of Home Economics
Canadian Fisherman	Journal of Nutrition
Canadian Journal of Chemistry	Journal of the American Chemical Society
Canadian Journal of Technology	Journal of the American Dietetic Association
Canner	Journal of the American Oil Chemists' Society
Chemical Abstracts	Journal of the Association of Official Agricultural Chemists
Chemical and Engineering News	Journal of the Fisheries Research Board of Canada
Chemical Engineering	Journal of the Science of Food and Agriculture
Chemistry and Industry	Maine Coast Fisherman
Commercial Fisheries Review	Meldinger Fra SSF (Herring Industry, Norway)
Commercial Fisherman	Modern Packaging
Drug and Cosmetic Industry	Modern Refrigeration
FAO Fisheries Bulletin	National Fisherman
Federation Proceedings	National Provisioner
Feedstuffs	Nature
Fisheries Newsletter (Australia)	Nutrition Reviews
Fish. Res. Bd. Can., Prog. Repts. Atlantic Coast Stas.	Pacific Fisherman
Fish. Res. Bd. Can., Prog. Repts. Pacific Coast Stas.	Pan American Fisherman
Fisherman	Poultry Science
Fishermen's News	Practical Home Economics
Fishing Gazette	Progressive Fish-Culturist
Flour and Feed	Quick Frozen Foods
Food Engineering	Refrigerating Engineering
Food Manufacture	Report of the Food Investigation Board (Great Britain)
Food Packer	Science
Food Preservation Quarterly	Southern Fisherman
Food Processing	Trade News (Fisheries Department, Canada)
Food Research	Western Fisheries
Food Science Abstracts	World Fishing

Articles chosen for abstracting or inclusion as bibliographical references are those deemed of interest to the commercial fisheries and to fishery technological laboratories. Occasionally pertinent articles from sources other than the above listed publications are included. Biological papers are generally omitted.

8. 59	PHOSPHATASES OF THE LIVERS AND VARIOUS ORGANS OF FISHES Bouchilloux, Simone Compt. rend. soc. biol. 144, 1532-3 (1950) Chemical Abstracts 45, No. 16, 7260 (1951)	8. 59	CHEMICAL STUDIES ON LUSTROUS PARTICLES IN EPIDERMIS OF HAIR- <u>TAIL</u> , <u>TRICHIURUS HAUMELA</u> Ota, Fuyuo Bulletin of the Japanese Society of Scientific Fisheries 19, No. 11, 1061-68 (1954) (English summary and tables) I. On the chemical constituents of its raw particles II. On the presence of uric acid in its raw particles "From the particle, uric acid and guanine were each isolated first with 1% borax solution and next with 4% sodium hydroxide solution, and identified by paper chromatographic and other analysis."
8. 59	STEROLS AND OTHER UNSAPONIFIABLE SUBSTANCES IN FATS OF SHELLFISH, CRUSTACEA AND ECHINODERMATA. VIII. HYDROGENATION PRODUCT OF CORBISTEROL Kita, Minoru and Toyama, Yoshiyuki J. Chem. Soc. Japan, Pure Chem. Sect. 70, 451-3 (1949) Chemical Abstracts 45, No. 7, 3088 (1951)	8. 59	BIOCHEMICAL STUDIES ON THE FISH-BLOOD. III. ON THE SPECIFIC GRAVITY AND CHEMICAL COMPONENTS OF BLOOD AND PLASMA Saito, Kaname Bulletin of the Japanese Society of Scientific Fisheries 20, No. 3, 196-201 (1954) (English summary tables and figures)
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8. 59	STUDIES ON THE PIGMENTS OF WHALE OIL. IV. ON THE FRACTIONATION OF THE PIGMENTS Mukai, Katunori Bulletin of the Japanese Society of Scientific Fisheries 20, No. 2, 136 (1954) (English summary and tables) "By qualitative test and paper chromatography, iron was detected on all of the separated pigments, and the author ascertained that the iron is derived from the blood of the raw materials."	8. 59	CHITINASE AND THE INTESTINAL BACTERIAL FLORA OF GASTROPODS Jeuiaux, Charles Acad. roy. Belg., Classe sci. Mem., Collection in 8°, 28, No. 7, 5-45 (1954) Chemical Abstracts 48, No. 16, 9567 (August 25, 1954)
8. 59	STUDIES ON THE CATALASE OF FISHES. II. DISTRIBUTION OF CATALASE IN THE FISH-ORGANS Fukuda, Hironari and Higuchi, Toshiaki Bulletin of the Japanese Society of Scientific Fisheries 20, No. 3, 232 (1954) (English summary and tables) "Liver leads the list in catalase contents and next come kidney and pyloric coeca in this respect. Red meat is richer in catalase than the white meat."	8. 59	BIOCHEMICAL STUDIES OF THE SALMON, <u>ONCORHYNCHUS KETA</u> Zama, Kouichi and Igarashi, Hisanao Bulletin of the Japanese Society of Scientific Fisheries 19, No. 11, 1087 (1954) (English summary and tables) II. The changes in the components of depot fats during the spawning migration III. The changes in the components of liver fats during the spawning migration
8. 59	REDUCING SUBSTANCES IN <u>ZOSTERA</u> Wood, E. J. Ferguson Nature 172, No. 4385, 916 (November 14, 1953) During a study of the reduction of sulphates in <u>Zostera</u> mud flats, it was found that when auto-claved <u>Zostera</u> was added to autoclaved sand and sea water, ferrous sulphide was rapidly produced.	8. 59	STUDIES ON MUSCLE OF AQUATIC ANIMALS. XVI. DISTRIBUTION OF EXTRACTIVE NITROGENS IN MUSCLES OF SEVERAL KINDS OF GASTROPOD Simidu, Wataru; Hibiki, Sigeyuki; Sibata, Sakae; and Takeda, Kazuo Bulletin of the Japanese Society of Scientific Fisheries 19, No. 8, 871 (1953) (English summary and tables) "An account of the distribution of extractive nitrogens in muscles of ear-shell, wreath-shell and pond-snail, with special references to their taste."

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Changes in fish oil during rendering	25	6.133	Bacterial spoilage	21	2.01
Fish oil polymerization	25	6.133	Spoilage of frozen shark	21	2.01
Molecular distillation of whale oil	25	6.137	Tuna		
Fish-oil refining	25	6.137	Tuna in the central Pacific Ocean	9	1.1
Processing fatty oils	25	6.137	The tuna fleet	9	1.1
Freshness of fish			Vitamins, B-complex, miscellaneous		
Freshness of whale meat	21	2.01	B-vitamins from codfish eyes	29	8.64
Frozen fish, general			Vitamins, vitamin B ₁₂ and protein utilization factor(s)		
Quality-control program	7	3.2	Vitamin B ₁₂ in fish liver	29	8.64
Elimination of frost heaving	7	3.231	Vitamins, miscellaneous		
			Vitamins from mollusk waste	25	6.55

8. 64	VITAMIN B ₁₂ CONTENT OF ORGAN MEATS Scheid, Harold E. and Schweigert, B. S. Journal of Nutrition <u>53</u> , No. 3, 419 (July 10, 1954)	8. 64	ANIMAL PROTEIN FACTOR (APF) AND VITAMIN B ₁₂ IN MARINE PRODUCTS. III. SEAWEEDS (PART 2) AND OTHERS Hashimoto, Yoshiro and Sato, Tokuji Bulletin of the Japanese Society of Scientific Fisheries <u>19</u> , No. 10, 987 (1954) (English summary and tables) "The vitamin B ₁₂ content was determined on about 30 species of seaweeds, a fresh-water alga, several zoo- and phytoplankton, and the bottom mud of a fresh-water pond by the Euglena method."
8. 64	THE ANTIPERNICIOSA AGENT IN FISH LIVER Ammon, R. and Roever, W. Arzneimittel-Forsch. <u>1</u> , 27-28 (1951) Chemical Abstracts <u>45</u> , No. 22, 10506 (1951)	8. 64	NUTRITIVE VALUE OF SOME BOMBAY FISH. I. DISTRIBUTION OF NONPROTEIN NITROGEN EXTRACTIVES, AND THIAMINE, RIBOFLAVINE, AND NIACIN Joshi, S.; Master, F.; and Magar, N. G. Indian J. Med. Research <u>41</u> , 431-9 (1953) Chemical Abstracts <u>48</u> , No. 13, 7810 (July 10, 1954)
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8. 64	THE VITAMINS OF FISH LIVERS. IV. RIBOFLAVIN CONTENT OF FISH LIVERS. I. Higashi, Hideo and Iseki, Shigeo J. Agr. Chem. Soc. Japan <u>18</u> , 369-78 (1942) Chemical Abstracts <u>45</u> , No. 6, 2553 (1951)	8. 7	CUTTLE-FISH OIL AND MACKEREL OIL Toyama, Yoshiyuki; Yamada, Minoru; Takai, Hideko; and Mizuta, Masateru Mem. Fac. Eng. Nagoya Univ. <u>5</u> , 104-9 (1953) (In English) Chemical Abstracts <u>48</u> , No. 19, 11817 (1954) "Sixteen samples of mackerel oil, from the offals of <i>Scomber japonicus</i> , had d ₂₀ 0.9178 - 0.9246 (av. 0.9213); n _D 1.4746 - 1.4794 (av. 1.4778); sapon no. 187 - 197 (av. 192); iodine no. 140 - 166 (av. 152); unsapon. matter 0.41 - 3.02 percent (av. 1.23 percent); ether-insol. brominated fatty acids 39.8 - 58.1 percent (av. 47.9 percent). In several of these oils 22 - 25 percent of the acids were said, and E ₁ cm. was 0.144 - 0.328 at 328 mμ. Similar data are given for cuttle-fish oil."
8. 64	DISTRIBUTION OF VITAMIN B ₁ IN ANIMAL AND PLANT TISSUES. II. Dohi, Keizaburo J. Biochem. (Japan) <u>35</u> , 419-30 (1942) Chemical Abstracts <u>45</u> , No. 7, 3000 (1951)	8. 7	COMPOSITION OF THE MUSSEL (MYTILUS EDULIS). I. THE FATTY COMPONENT de Mingo, M. and Calles, J. A. Rev. real acad. cienc. exact., fish, y. nat. Madrid <u>40</u> , 361-92 (1946) Chemical Abstracts <u>45</u> , No. 2, 773 (1951)
8. 64	VITAMIN B COMPLEX FROM EYES OF COD FISH Suzuki, Yuji Japan, patent 173,773 (October 2, 1946) Chemical Abstracts <u>46</u> , No. 6, 2761 (1952)	8. 7	CUTTLEFISH OIL Shimo, Kotaro and Anazawa, Shigeru Bull. Chem. Research Inst. Non-Aqueous Solns., Tohoku Univ. <u>3</u> , 17-23 (1953) Chemical Abstracts <u>48</u> , No. 13, 7918 (1954)

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